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Contents

Abstract

We explore how demographic changes in the Asia and Pacific region are likely to influence economic growth and other features of the regional economy. While many low-income countries in the region will continue to experience a demographic dividend, over time population aging could drag on economic growth, especially in East Asia. A second potential problem from population aging is the strain on public transfer systems the effects of which, although smaller than those in Europe, Japan, or Latin America, will still be large. Countering these problems, however, population aging will lead to substantial capital deepening, an effect of the second demographic dividend. Given current patterns of old-age consumption, production, and transfers, the total demand for pension assets will increase very substantially over the coming decades. Under these circumstances, aging should not depress savings rates. Capital deepening and high standards of living are attainable despite significant population aging.

I. Introduction

The Asia and Pacific region is extraordinarily diverse, but all of the economies are experiencing a demographic transition with important common features related to population size, growth, and age structure. In many of them, demographic change favors economic growth in both aggregate and per capita terms because working-age populations are growing more rapidly than dependent populations and are creating a demographic dividend. In a few economies in the region and in many more in the near future, however, the obviously favorable demographics are coming to an end. They will experience slower growth and then declines in their working-age populations and substantial increases in their old-age populations. We explore how these demographic changes are likely to influence economic growth and other features of economies in the Asia and Pacific region. Several key findings emerge.

(i) Many countries including Bangladesh, India, Indonesia, Pakistan, and the Philippines will continue to experience a demographic dividend as their working-age populations grow relative to their dependent populations. Favorable conditions should persist for at least the next 15 years and, in most cases, for much longer.

(ii) The magnitude of the demographic dividend depends on age patterns of labor income and consumption. For most countries estimates of these patterns are not available, but based on eight economies of the region for which age profiles have been constructed, a substantial demographic dividend can be expected.

(iii) Over time, the populations of the Asia and Pacific region will become increasingly concentrated at older ages where in all cases labor income is quite modest. In part this reflects low levels of employment at older ages, but it also reflects low wages and productivity for older adults who are working.

(iv) Low labor income is often matched with high consumption among the elderly in high-income countries. This pattern is true of Asia as well although the picture is more mixed. In middle- and low-income countries, the elderly are consuming at levels similar to those for other adults.

(v) Population aging could serve as a drag on economic growth over the coming decades as the effective number of workers declines relative to the effective number of consumers. East Asia faces the most serious problems. In the Republic of Korea, for example, the support ratio is expected to decline by 0.8% per year

over the next 40 years. In the absence of compensating changes, standards of living would thus be reduced by more than 25% between 2010 and 2050.

(vi) A second potential problem from population aging is the strain on public transfer systems. The old-age transfer system is relatively underdeveloped in many Asian countries so the effects would be smaller than those in Japan, Europe, or Latin America, but the effects will still be large. In a "business as usual" simulation, transfer wealth (or implicit debt) would range from 90% of total labor income in the Pacific island nations to 240% of total labor income in East Asia by 2050.

(vii) If countries in the region were to shift toward consumption, labor income, and transfer patterns characteristic of rich countries, implicit debt would increase to much higher levels. For the Asian Development Bank's developing member countries (DMCs), implicit debt would reach 320% of total labor income in 2030 and 540% of total labor income in 2050.

(viii) Population aging will lead to substantial capital deepening. For the DMCs as a whole, given their low income profiles, pension assets would rise from 1.2 times total labor income to 2.1 times total labor income in 2030 and to 2.7 times in 2050. Capital deepening should provide a boost to economic growth that easily dominates the effects of a declining support ratio.

(ix) Given current patterns of old-age consumption, production, and transfers, the total demand for pension assets will increase very substantially over the coming decades, rising from $26 trillion in 2010 to $157 trillion in 2050.

(x) Under these circumstances, aging should not depress savings rates. The gross savings rates required to meet the demand for pension assets would increase from 12.2% of gross domestic product (GDP) in 2010–2020 to 15.4% of GDP in 2040–2050. The view that population aging will lead to lower savings rates is not borne out by the analysis presented here.

II. The First Demographic Dividend

A change in population age structure has a very direct, first-order effect on income and consumption that does not depend on behavioral responses. An increase in the population concentrated in the working ages, given output per worker, leads to an increase in output or income per person. Holding the savings rate constant in addition to output per worker, an increase in the share of persons in the working ages leads to higher consumption per person (Bloom and Williamson 1998, Mason 2001, Mason and Lee 2007).

The demographic dividend follows from a simple identity:

$$\frac{C}{N} = (1-s)\frac{Y}{L}\frac{L}{N}, \tag{1}$$

where *C/N* is per capita consumption, *s* is the savings rate, *Y/L* is income per worker, and *L/N* is the support ratio, i.e., the number of workers per person. How changes in population age structure influence the savings rate and output per worker is an important and complex issue. The effects of changes in population age structure through the support ratio, however, are direct and unambiguous. Age transitions in Asia, the Pacific, and elsewhere are leading to swings in population concentrations in the working ages and swings in the support ratio matched by swings in per capita income and consumption.

The relationship between consumption growth and growth in the support ratio can also be readily represented as a simple transformation of equation. Let *gr*[] represent the growth rate:

$$gr[C/N] = gr[1-s] + gr[Y/L] + gr[L/N]. \tag{2}$$

Holding the savings rate and income per worker constant, the growth rate of income per capita and consumption are equal to the growth rate of the support ratio.[1]

Researchers have constructed the support ratio in different ways. One approach is to use a purely demographic measure: the population in the working ages divided by the total population. The approach used here is to incorporate age variation in the numerator and denominator that reflects systematic differences in labor income and consumption over the life cycle. A similar approach was used by Cutler et al. relying on very simple assumptions (Cutler et al. 1990). Here we exploit newly available, detailed estimates of consumption and labor income profiles to construct the support ratio.

The value of labor provided by an additional individual of any age depends on age patterns of labor force participation, hours worked, unemployment rates, and productivity. In general, the value of labor rises at young adult ages and then declines later in life, but details vary across countries influenced by features of the labor market, investment in education, returns on experience, skill obsolescence, disability patterns, employment practices, mandatory retirement policies, tax and pension systems, and so forth. Consumption also varies systematically with age because of tastes, physiological factors, and many other issues. Age variation in consumption should not be ignored. The very young do not produce, but they may not consume much. In some countries, the elderly do not produce much, but they consume a great deal. Hence, an important refinement of the support ratio is to incorporate age variation in the value of goods and services

[1] The growth rate of per capita income is equal to the sum of the second and third terms on the right-hand side.

produced and consumed at each age. This is accomplished by constructing a support ratio that uses weighted population:

$$\frac{L_t}{N_t} = \frac{\sum_x y_0(x)P(x,t)}{\sum_x c_0(x)P(x,t)}, \tag{3}$$

where $y_0(x)$ is the labor income age profile in the base year, $c_0(x)$ is the consumption profile in the base year, and $P(x,t)$ is the population by age x.[2]

Two strategies have been employed in recent studies to estimate the demographic dividend. One approach is to apply a regression analysis to pooled, cross-section, time series data for national economies. This approach has been used by Bloom and Williamson (1998), Bloom and Canning (2001), and Kelley and Schmidt (1995 and 2007). An alternative approach is to rely on simulation models of varying complexities (Mason 2001; Mason and Lee 2007; Mason, Lee et al. 2010; Romero, Patxot et al. 2010). Either approach supports the view that the demographic dividend has been quantitatively important, especially in East Asia.

The rate of growth of the support ratio—the first demographic dividend—varies in its timing and magnitude in each economy depending on the speed and magnitude of changes in population age structure. In East Asia, for example, the age transition has been very rapid, and the swings in age structure have been very large. Changes in the support ratio also depend on policies, institutions, and behavioral differences that influence the ages at which people enter and leave the labor force, age variation in unemployment and hours worked, and age patterns of unemployment. Also influencing it are factors that affect consumption at each age. Adding a child to a population will have a smaller effect than adding an elderly adult if the child consumes less than the adult (Mason 2005).

The analysis presented below builds on these concepts and exploits newly available estimates of age patterns of labor income and consumption. New estimates of the support ratio and the first demographic dividend are presented, which show benefits from an increasing support ratio, but in the future, a declining support ratio will pervade in the region.

[2] The labor income and consumption profiles are both normalized by dividing them by the average labor income of those aged 30–49. The consumption profile is scaled so that the average consumption of those aged 30–49 is 60% of average labor income of those aged 30–49. This adjustment eliminates the effects of intercountry differences in savings rates on the support ratio.

III. The Second Demographic Dividend

The support ratio quantifies the first-order effect on income or consumption of changes in the population age structure. Income per capita varies in direct proportion to changes in the support ratio given income per worker; consumption per capita varies in direct proportion to changes in the support ratio given income per worker and the savings rate. In the absence of other changes, age transition can lead to more rapid economic growth, but with population aging, the support ratio declines and economic growth is curtailed. Responses to demographic changes by individuals, families, firms, and governments may, however, lead to very different and possibly more favorable outcomes.

In general, societies can respond to changes in population age structure in one of four ways. One possibility is to allow consumption to vary. Standards of living will rise as the support ratio becomes more favorable and will decline as it deteriorates. This would be the inevitable outcome if societies relied exclusively on transfer programs to meet the needs of dependent populations. Transfer systems can affect the distribution of income and consumption but not the totals; hence, per capita income and consumption will rise and fall with the support ratio.

A second possible response is to change policies or behaviors that link change in population age structure to the support ratio. People can work longer by delaying retirement, and women may choose to enter the formal labor force in greater numbers in part as a result of lower fertility. As older adults enjoy longer, healthier lives, delaying retirement appears to be a natural response. Policies that prohibit and discourage older workers from continuing their employment can be reformed. Consumption patterns, particularly spending on health care and long-term care, are also very important.

A third possibility is to increase investment in human capital. Low fertility results in relatively fewer workers, but increased spending on human capital can make them more productive. This possibility is discussed in some detail by Lee and Mason (2010), Ogawa et al. (2009), and Prettner and Prskawetz (2010).

A fourth possible response is that workers may increase their savings in order to fund a longer period of retirement. They may do this through personal savings, through pension systems funded by employers, or through publicly funded retirement programs. This response initially leads to higher savings and lower consumption, but the additional capital that is generated is growth-enhancing, and eventually income per worker rises, offsetting to some extent the decline in the support ratio. Not all changes in savings and wealth are necessarily behavioral, however, and changes in the age composition of the population also have an important influence.

IV. Population, Savings, and Wealth

Concerns often raised about population aging are that it will lead to lower savings rates and a decline in capital and to all of the attendant economic problems, e.g., slower economic growth and a collapse in asset prices. Among mainstream economists, however, the most familiar idea about the relationship between population and capital is embodied in the Solow growth model. Solow showed that given a constant savings rate, slower labor force growth would lead to an increase in capital per worker and per capita income (Solow 1956). Thus, in the simple accounting identity—equation (2)—changes in the growth rate of the labor force will influence output per worker. Given the savings rate, a decline in the support ratio due to a decline in the growth rate of the effective labor force will lead to capital deepening and to higher income per capita. Capital deepening induced by slower labor force growth will to some extent offset the effect on economic growth of the decline in the support ratio that occurs as populations grow more slowly and age.

To understand how changes in population age structure influence the capital–output ratio and labor productivity, it is essential to understand how the aggregate savings rate is influenced by changes in population age structure. Many studies have addressed this issue relying on the life cycle savings model. Tobin (1967) extended the neoclassical growth model with endogenous life cycle savings. Cutler et al. (1990) explored the effects of aging using a Ramsey framework and concluded that population aging would lead to higher standards of living because a lower savings rate would be needed to maintain the capital output ratio in an aging United States (US) economy. Mason and Lee (2007) modeled a small open economy and showed that population aging would lead to a substantial increase in assets that would be sufficient to offset the effects on per capita consumption of a decline in the support ratio, but only if there were strong reliance on life cycle savings to fund old-age retirement. If countries rely primarily on either public or private transfers to support retirement needs, population aging leads to a significant decline in per capita income and per capita consumption.

A similar conclusion is reached for a closed economy in equilibrium (Lee and Mason 2010, Romero et al. 2010) and in economies with immigration (Mason et al. 2010). These studies vary in their details but agree that population aging may lead to an increase in capital and standards of living because it will not lead to a decline in savings rates sufficient to offset the capital deepening effects of slower labor force growth. An important point, however, is that the link between population aging, savings, and capital will depend to a significant degree on the extent to which saving is motivated by life cycle concerns. This, in turn, will depend on the extent to which the elderly are relying on continued work, adult children, and public transfer programs rather than on personal wealth to support old-age consumption.

Many studies have considered the effects of changes in population age structure on savings rates. Relying on variants of the life cycle model, several have used aggregate, cross-section, time series data to estimate the effects of age structure on aggregate savings (Mason 1981, Fry and Mason 1982, Mason 1988, Higgins and Williamson 1997, Higgins 1998, Bosworth and Chodorow-Reich 2007) and have concluded that savings rates will rise and then fall over the course of the demographic transition.

The strong effects on savings of population age structure are often driven by savings rates in Asia which have experienced especially large swings during the demographic transition. Several explanations have been offered for why these patterns have been so important in Asia including the rapid rate of economic growth, less reliance on public transfer systems for old-age support, and the speed of the demographic transition. Using both historical and contemporary data, Kinugasa (2004) and Kinugasa and Mason (2007) showed that rapid increases in life expectancy led to high savings rates and increases in wealth per capita. An important feature of their result is that the finding in contemporary economies is confined to Asia where transfer systems tend to be less important for old-age support than they are in Europe and Latin America.

The empirical evidence about savings and demography is far from settled as saving may be very context dependent in ways that have not been fully captured by empirical models (Zhang and Zhang 2005). Another difficulty is that behavioral responses to population aging are quite complex. Increases in life expectancy and the duration of retirement may influence the age at retirement (Bloom et al. 2003), the extent to which the elderly can rely on family members for support, and the magnitude of public transfer systems (Preston 1984).

Simulation analyses have often been used to consider the implications of population age structure for life cycle savings. One value of such models is to assess whether the large swings in savings rates observed in Asian countries, for example, can be explained by the life cycle model. Most studies have concluded that demographic change produces swings in savings rates that are more modest than the observed changes and more modest than those implied by empirical studies. Lee, Mason et al. (2003), for example, concluded that changes in age structure can explain US savings trends but not the sharp increases in savings in Taipei,China which can instead be explained by changes in population age structure combined with a rapid shift in the old-age support system from familial transfers to life cycle savings.

V. The Economic Life Cycle

Changes in population age structure matter only because the human life cycle influences economic behavior in important, fundamental ways. During the periods of "dependency" at the beginning and the end of life, we consume much more than we produce through our labor. Sandwiched between is a period during which we consume much less than we produce through our labor. This economic life cycle is central to our analysis. First, the interaction between the economic life cycle and population age structure determines the support ratio and the magnitude of the demographic dividend. The economic life cycle is critical to the timing and magnitude of the dividend and is also critical to identifying ways in which changes in behavior or policies might influence it. Second, the economic life cycle is the fundamental building block for life cycle savings as it determines life cycle needs for accumulating wealth.

The National Transfer Accounts (NTA) provide comprehensive estimates of economic flows by age in a manner consistent with national income and product accounts; research teams in 35 countries are currently constructing them. In Asia, accounts have been constructed for eight economies: the People's Republic of China (PRC); India; Indonesia; Japan; the Republic of Korea; Philippines; Taipei,China; and Thailand (Lee et al. 2008, Mason et al. 2009, Lee and Mason 2011). Detailed information about NTA is available at www.ntaccounts.org.

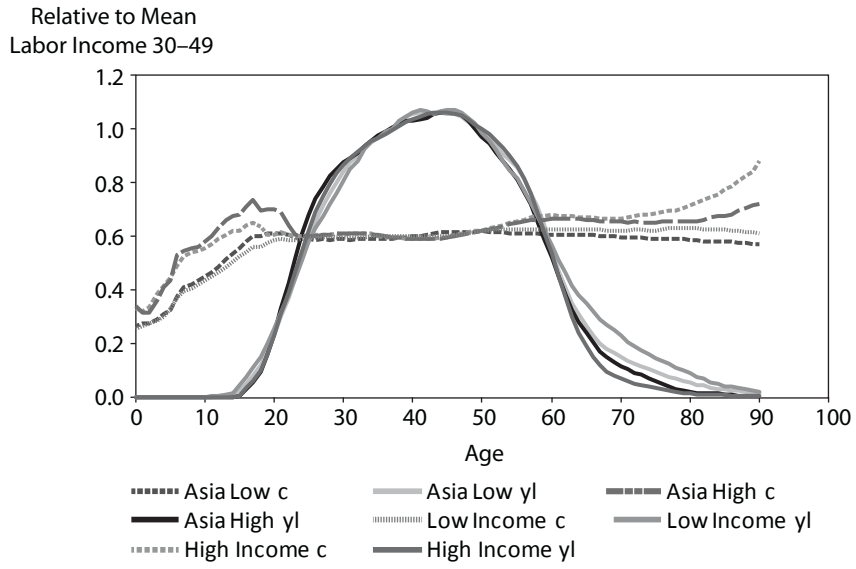
The economic life cycle is defined by age profiles of labor income and consumption. Labor income is a comprehensive measure of the value of labor production at each age reflecting age variation in labor force participation, unemployment rates, hours worked, and wages. Labor income includes the estimated value of labor of unpaid family workers who often are young or old. Also included are benefits provided by employers including their contributions to publicly funded social security programs. Labor income does not, however, include the value of time spent in child rearing and other important forms of in-home production.

Consumption is also a comprehensive measure that is both public and private. Public education and publicly funded health care, for example, are allocated to age groups relying on a combination of administrative records and household surveys. Nonassignable public consumption is allocated to age groups in proportion to the population in those age groups. Private consumption is allocated to age groups using nationally representative household surveys. Detailed methods are described in the references provided above.

NTA estimates are currently available for 23 economies. Per capita labor income and consumption profiles are charted in Figure 1 using simple averages in four different groups. The low-income group includes the 12 economies with the lowest per capita incomes, and the high-income group includes the 11 with higher per capita incomes. In Asia, the low-income group includes the PRC, India, Indonesia, the Philippines,

and Thailand. The high-income group includes Japan; the Republic of Korea; and Taipei,China.

Figure 1: Per Capita Consumption and Labor Income by Age in Low- and High-Income Economies



c = consumption, yl = labor income.
Sources: Lee and Mason, forthcoming; NTA database, available: www.ntaccounts.org, accessed 12 May 2011.

The labor income profiles for high-income economies and Asian high-income economies are very similar except that labor income is somewhat higher in Asia than in the combined high-income profile. Likewise, the labor income profile in the low-income economies of Asia is very similar to that in low-income economies in general though it has a somewhat different profile than that in high-income economies. In low-income economies, labor income rises at a somewhat earlier age but a bit more slowly than in high-income economies. The peaks come at similar ages. At older ages, low-income economies have relatively high labor incomes.

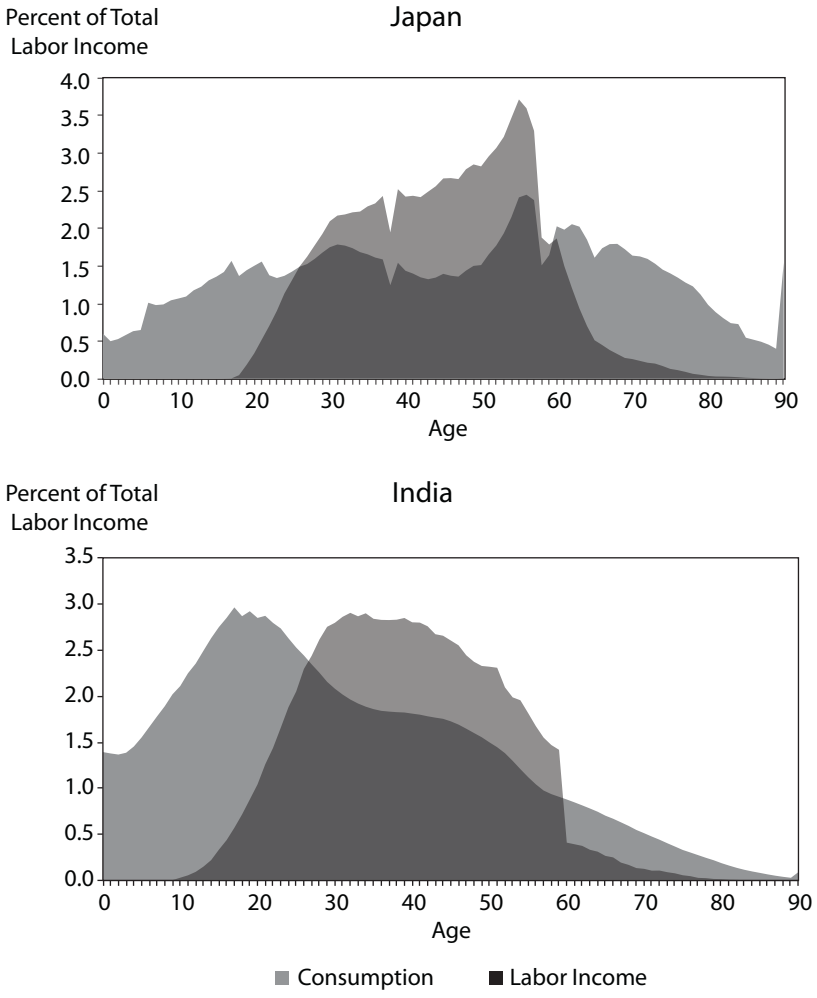
The consumption profile for low-income Asian economies is not much different than that of low-income countries in general. Consumption rises with age during childhood and then is remarkably flat across adult ages. In high-income economies, child consumption is higher at all ages, particularly among school-age children. Human capital spending on children is very high in high-income Asian economies, and the consumption profile is not flat over the adult ages. Consumption is higher among adults in their late 50s and 60s compared with younger adults.

Starting in the late 60s or early 70s, consumption rises steeply in non-Asian high-income countries but is less pronounced in Asia. The steep increase is primarily a consequence

of high levels of spending on health and long-term care. Asia's high-income economies are quite varied, however. Consumption rises steeply at older ages in Japan, less so in Taipei,China, and actually declines in the Republic of Korea. It must be kept in mind that these estimates are for a year near 2000. Some important changes may have occurred in recent years, but the key features of the profiles are quite persistent based on a preliminary analysis of time series estimates.

Aggregate consumption and labor income by age vary considerably as population age structure changes. This point is illustrated in Figure 2, which compares aggregate consumption and production by age in India with aggregate consumption and production by age in Japan. In India, the life cycle deficit for children—the difference between their consumption and labor income—is enormous while the life cycle deficit for the elderly is relatively small. In Japan, however, the old-age deficit for the elderly is somewhat larger than the deficit for the young. Although the per capita profiles for India differ from Japan's, population age structure is the main cause for the difference in the aggregate profiles for these two countries and for other countries that have been studied.

Figure 2: Aggregate Consumption and Labor Income by Age in Japan and India in 2004



Source: National Transfer Accounts database, www.ntaccounts.org accessed 12 May 2011.

Studies of the economic implications of population age structure usually emphasize the overall level of dependency using the support ratio, the dependency ratio, or a similar measure. The next section follows this approach by describing changes in the support ratio that are occurring in Asia. This is a very useful starting point for considering the economic implications of changes in population age structure, but it is very important to keep in mind that it is only a starting point.

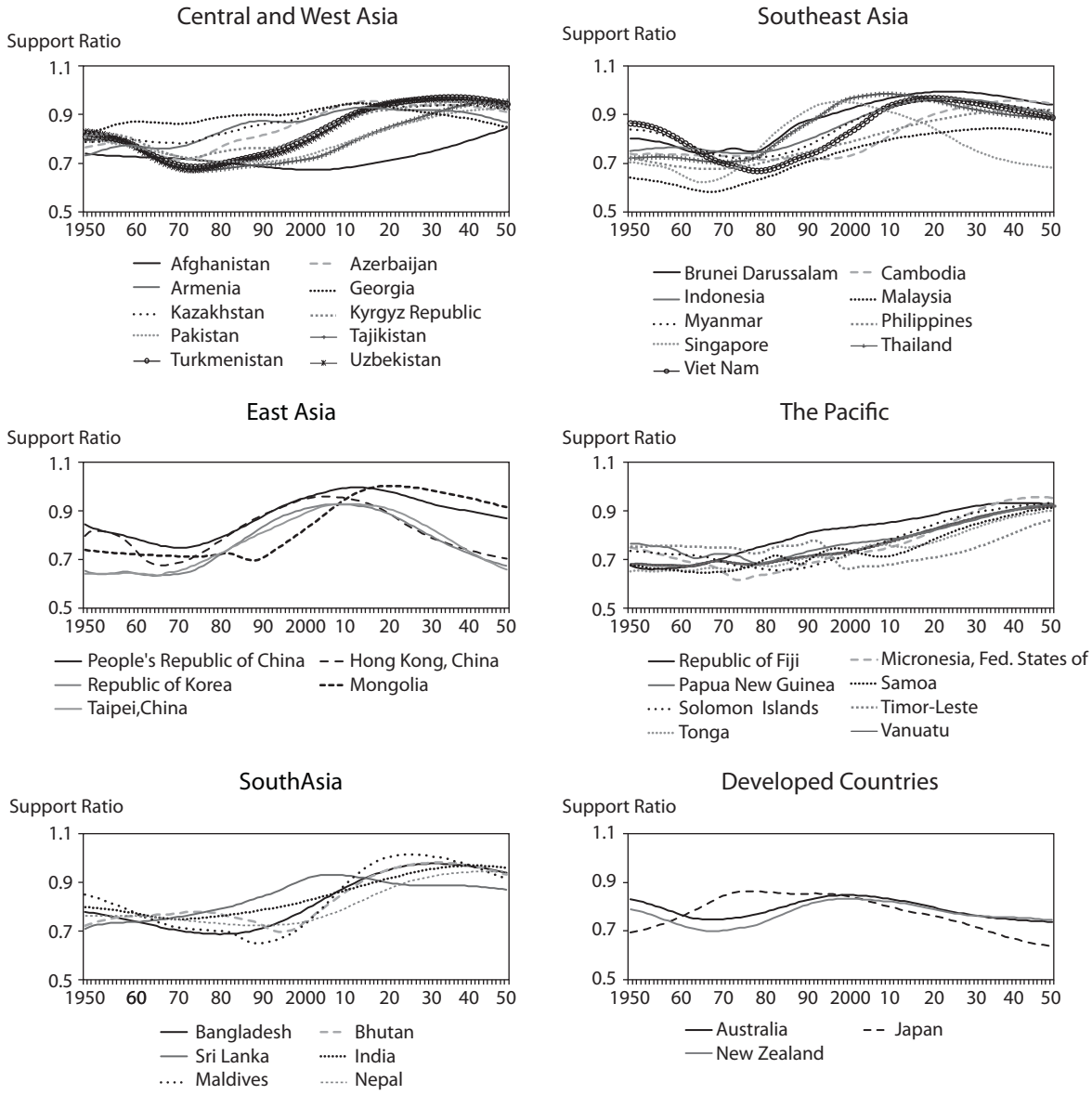
VI. Support Ratio

The support ratio shown in equation (3) for the Asia and Pacific economies was constructed using population data and the age profiles of consumption and labor income shown in Figure 1. The population data were taken from United Nations (UN) population estimates and projections based on the medium fertility scenario. For the base year labor income and consumption weights, the low-income Asian profiles were used except for Japan; Hong Kong, China; Malaysia; the Republic of Korea; Singapore; and Taipei,China where high-income profiles were used. See Appendix Table 1 for detailed estimates.

The East Asian DMCs in the second panel of Figure 3 are distinctive because their age transition has been so rapid. The PRC provides a useful benchmark against which other countries can be compared. The support ratio declined between 1950 and the early 1970s due to improved child survival then began to increase as a consequence of lower birth rates and child dependency. This increase has continued since 1972, but it is currently very close to its peak. In the coming decades, the support ratio will decline as smaller cohorts begin entering the labor force and as the elderly live to older ages. By 2050, the support ratio in the PRC will be only slightly greater than it was in 1950.

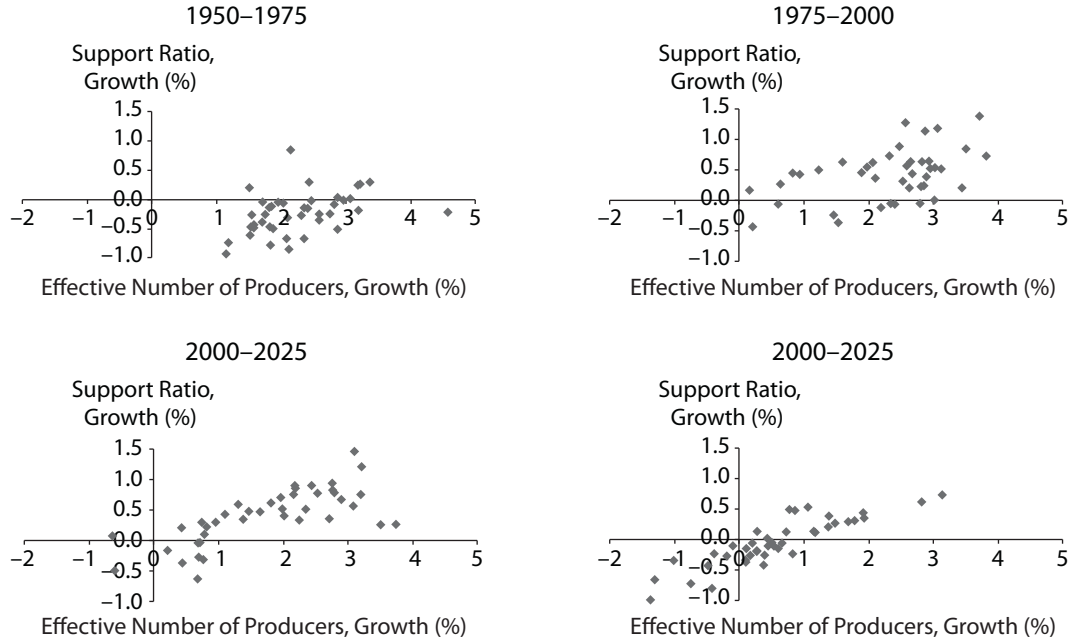
As in the PRC, the support ratio declined in most Asian developing countries and then increased in essentially all of them though the point at which it began to increase varied considerably. A broad perspective on the growth in the support ratios is provided in Figure 4, which plots their growth rates in each economy against the rate of growth of the effective number of producers during four periods. The effective number of producers is the population weighted by the labor income profile, i.e., the numerator of the support ratio. From 1950 to 1975, the effective number of workers was growing between 1% and 3% per annum in all but a few countries, but in most cases, the effective number of consumers was growing even more rapidly, and the support ratio was declining by as much as 1% per year.

Figure 3: Support Ratios in the Asia and Pacific Region, 1950–2050



Source: Authors' calculations using the NTA database, available: www.ntaccounts.org, accessed 29 June 2011.

Figure 4: Support Ratio versus Effective Number of Producers, Annual Growth Rates in the Asian and Pacific Economies, 1950–2050



Source: Authors' calculations using the NTA database, available: www.ntaccounts.org, accessed 29 June 2011.

Between 1975 and 2000, the rate of growth of effective producers shifted toward zero in some countries but remained very high in many others. The mass of points shifted to a higher level as the greater majority of countries experienced a rising support ratio. The next 50 years is marked by a steady shift toward the southwest quadrant where the effective number of workers and the support ratio are both declining.

Two phases in the trend in the support ratio are of particular interest: the rise that marked the first demographic dividend and the decline that for most countries is coming in the future. The timing and magnitude of the first dividend are quite varied. In the Republic of Korea, the support ratio began its steep ascent in 1966 while in Pakistan it did not begin to rise for another 20 years. The support ratio is expected to peak in the PRC in 2015 after rising for more than 4 decades. A few other countries have similarly rapid transitions, e.g., Thailand and Viet Nam. For many others, the transition from trough to peak is much slower e.g., 51 years in Bangladesh, 69 years in India, and 77 years in the Philippines (Table 1).

Table 1: Growth in the Support Ratio during the First Demographic Dividend in Selected Countries

	Minimum		Maximum				
	Support Ratio	Year	Support Ratio	Year	Span	Total Gain (%)	Annual Gain (%)
Bangladesh	0.69	1982	0.98	2033	51	42.1	0.69
China, People's Rep. of	0.75	1972	1.00	2015	43	33.0	0.66
India	0.75	1973	0.97	2042	69	29.3	0.37
Indonesia	0.74	1976	0.96	2026	50	30.3	0.53
Japan	0.69	1950	0.86	1978	28	24.5	0.78
Korea, Rep. of	0.64	1966	0.93	2010	44	46.1	0.86
Pakistan	0.71	1986	0.92	2050	64	30.7	0.42
Philippines	0.68	1969	0.92	2046	77	36.2	0.40
Thailand	0.71	1971	0.99	2011	40	39.9	0.84
Viet Nam	0.67	1980	0.97	2021	41	44.8	0.90

Source: Authors' calculations using the NTA database, available: www.ntaccounts.org, accessed 29 June 2011.

In many Asian economies, the support ratio is projected to decline substantially by 2050, but in many others, the impact of population aging will just be starting. The support ratio is expected to drop to very low levels in Hong Kong, China; the Republic of Korea; and Singapore by 2050 while elsewhere it will decline substantially after 2050. Table 2 shows values for the same set of countries in Table 1 after the support ratio has peaked. The PRC, Japan, and the Republic of Korea are three countries in which the declining support ratio could be a serious drag on economic growth.

Table 2: Growth in the Support Ratio after the First Demographic Dividend in Selected Countries

	Maximum		Support Ratio in		Total Loss	Annual Gain
	Support Ratio	Year	2050	Span	(%)	(%)
Bangladesh	0.98	2033	0.94	17	−3.7	−0.22
China, People's Rep. of	1.00	2015	0.87	35	−12.7	−0.39
India	0.97	2042	0.96	8	−1.0	−0.12
Indonesia	0.96	2026	0.91	24	−6.1	−0.26
Japan	0.86	1978	0.64	72	−26.2	−0.42
Korea, Rep. of	0.93	2010	0.68	40	−27.2	−0.79
Pakistan	0.92	2050	0.92	0	0.0	na
Philippines	0.92	2046	0.92	4	−0.1	−0.03
Thailand	0.99	2011	0.89	39	−10.1	−0.27
Viet Nam	0.97	2021	0.89	29	−8.2	−0.30

na = not available.
Source: Authors' calculations using the NTA database, available: www.ntaccounts.org, accessed 29 June 2011.

The direct effect of the support ratio on per capita consumption—the first demographic dividend—is captured in equation (2). Given the savings rate and output per effective worker, an increase of 1% in the support ratio produces a 1% increase in consumption per effective consumer. The final two columns in Table 1 report the total gain in the

support ratio and the annual gain during the first dividend phase. The Republic of Korea has the largest total gain with an increase in consumption per effective consumer of 46%. Similar gains are projected for Bangladesh and Viet Nam. In contrast, the total gains for the PRC and India are smaller at 33% and 29%, respectively. Appendix Table 1 summarizes the support ratio for all the Asia and Pacific economies for which estimates could be constructed.

VII. Life Cycle Wealth, Pensions, and Transfer Systems

The economic life cycle is key to understanding how changes in population age structure influence the demand for life cycle wealth. Basic concepts are illustrated based on the experience of Japan before we look in more depth at the situation across the Asia–Pacific region.

A. Life Cycle Wealth in Japan

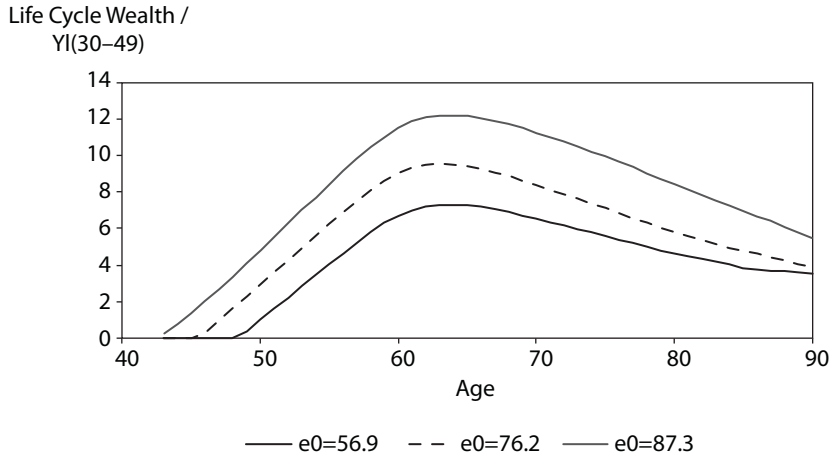
The relationship between demographics and the demand for life cycle wealth can be calculated given age profiles of consumption and labor income. For any cohort of adults aged *x* in year *t*, life cycle wealth is defined as the present value of lifetime consumption less the present value of lifetime labor income. This follows directly from the lifetime budget constraint and the assumption of no bequests. Life cycle wealth is the wealth necessary to realize a particular level of consumption at each future age given labor income at each future age. In order to construct a measure of life cycle wealth, we made several simplifying assumptions. First, the shapes of the age profiles of per capita consumption and labor income do not change over time, but they shift upward at a constant rate of growth. Second, the population is closed to immigration. Third, the discount rate is exogenous and constant. This removes potentially important general equilibrium considerations or economic feedback that has been explored in other studies discussed above.

Two demographic factors are considered here: changes in life expectancy that influence an individual's savings and changes in age structure that arise due both to longer life expectancy and to fertility declines. First, the effects of longer life expectancy on savings are analyzed by calculating the path of life cycle wealth over the life cycle for three different synthetic cohorts subject to the mortality conditions that prevailed in Japan in 1949, 1979, and 2009. Japan's mortality experience is quite useful for considering the effects of longer life expectancy because in the aftermath of World War II, Japan had the shortest life expectancy of any industrialized country; now it has the longest. Thus, the simulated changes for Japan are the maximum one could anticipate over a 60-year period.

The effect of gains in life expectancy on the demand for life cycle pension wealth may seem obvious to those who are not demographers. If people live longer but do not work longer, they must accumulate more wealth to support their old-age consumption. Gains in life expectancy, however, add years at all ages. When life expectancy is low, the gains tend to be concentrated at younger ages when people are both consuming and producing. As life expectancy reaches high levels, additional gains are concentrated at old ages where the effects on the demand for life cycle wealth are clear.

Figure 5 shows the demand for life cycle pension wealth using the per capita consumption and labor income profiles for Japan in 2004 (Ogawa et al. 2010) and age-specific mortality rates for Japan in 1949, 1979, and 2009 (Human Mortality Database). These values are for synthetic cohorts based on the assumption that mortality conditions remain constant at the levels observed in a particular year. The present value is calculated using a discount rate of 3%.

Figure 5: Simulated Per Capita Life Cycle Pension Wealth by Age for Japan



e0 = life expectancy, yl = labor income.
Source: Consumption and labor income profiles are NTA estimates for Japan in 2004 (Ogawa et al. 2010). Life expectancy and age-specific mortality rates are estimates for Japan for 1949, 1979, and 2009 (Human Mortality Database 2011, available: www.mortality.org, accessed 12 May 2011).

Life cycle wealth for each mortality level follows the classic life cycle pattern rising as individuals approach retirement, peaking during the early to mid-60s, and then declining. The accumulation does not begin until around age 40 because of the costs of child rearing that younger parents must bear. The profiles are shown only to age 90 but are calculated to higher ages (110 in 2009 and 1979; 107 in 1949). Given longer life expectancy, accumulation begins at a somewhat earlier age and is substantially higher at every age once begun.

The upward shift in the age profile of life cycle wealth generated by the rise in life expectancy is summarized in Table 3. The average of life cycle pension wealth is calculated as a simple average of the values for ages 50–90 inclusive. Given 1949 mortality conditions, the average life cycle wealth per person was about 5 times the average annual pre-tax labor income of a prime working-age (30–49) adult. The average rose to 6.7 times average labor income given 1979 mortality conditions and 9.2 times annual labor income given 2009 mortality conditions.

Table 3: Life Expectancy and Life Cycle Pension Wealth in Japan

	1949	1979	2009
Life expectancy at birth	56.9	76.2	87.3
Life cycle pension wealth	5.08	6.72	9.17
Partial effect	0.09	0.22	
Elasticity	1.13	2.65	

Note: Life cycle wealth is the simple average of values for those aged 50–90 normalized on labor income of those aged 30–49. Partial effect is change in wealth divided by the change in life expectancy. Elasticity is the percentage change in wealth divided by the percentage change in life expectancy. Both measures are for the 30-year periods.
Source: Authors' calculations using the NTA database, available: www.ntaccounts.org, accessed 29 June 2011.

The gain in life expectancy was much greater between 1949 and 1979 than between 1979 and 2009. The partial effect of an additional year of life expectancy is greater after 1979. Between 1949 and 1979, a 1-year increase in life expectancy shifted the age profile of wealth upward by about 0.1 of the annual pretax labor income of a prime working-age adult, but between 1979 and 2009, a 1-year increase shifted it upward by about 0.2 (partial effect). A similar conclusion follows using elasticities to compare effects. A 1% increase in life expectancy led to a 1.1% increase in wealth between 1949 and 1979 and to a 2.7% increase between 1979 and 2009.

The economywide demand for life cycle pension wealth depends on age structure as well as on changes in the age profile of life cycle wealth. The Japanese demand for life cycle wealth peaks when cohorts are in their early 60s, hence an increased concentration of the population near these peak wealth ages leads to greater aggregate wealth. In the special case of a steady-state population, the age distribution depends on the age schedule of survival and the rate of population growth (the fertility rate). A shift from low life expectancy and a high rate of population growth—characteristics of countries in the early stages of the demographic transition—yields a ratio of life cycle wealth-to-labor-income of only 1.5 (Table 4). By comparison, rates characteristic of rapidly aging societies (a life expectancy of 87 and a population growth rate of –1% per year) yields a wealth-to-labor-income ratio of 12.3.

Table 4: Life Cycle Pension Wealth Relative to Total Labor Income

	Life Expectancy at Birth		
Population Growth Rate	**87.3**	**76.2**	**56.9**
−0.01	12.3	7.5	4.1
0.00	8.4	5.3	2.9
0.01	5.7	3.7	2.1
0.02	3.9	2.6	1.5

Note: Values were calculated using the age profiles of life cycle wealth from Figure 5 and the population age distribution implied population growth rate and life table values (Lx) for Japan, as taken from the Human Mortality Database (www.mortality.org) accessed 6 April 2011.
Source: Authors' calculations.

The values in Table 4 rely on a steady-state assumption and hence provide little insight about the dynamics of life cycle wealth holdings. In the next section, the same concepts are applied in a more detailed fashion to project life cycle wealth over the next 4 decades in the Asia and Pacific region. The analysis goes beyond this calculation, however, to assess the extent to which the demand for life cycle wealth will be met by accumulating pension assets and by expanding transfers to support the elderly.

B. Life Cycle Wealth, Transfers, and Assets

Life cycle wealth is projected by assuming that given age patterns of consumption and labor income persist into the future while allowing for a constant and exogenous change in labor productivity due, for example, to technological progress. The objective of the projections is to answer the following question: In the absence of a labor response, how much additional wealth is required to sustain consumption levels that keep pace with changes in productivity? In effect, two of the possible responses to population aging are ruled out: sacrificing consumption and increasing work effort.

The additional wealth required to meet the needs of the elderly can be obtained in two ways. One way is to establish or expand transfer programs that provide pensions and fund health care services and other needs of the elderly. The alternative is to accumulate assets that can fund these same needs. The projections presented here present alternatives based on the experience of NTA economies in Asia that differ considerably in their emphasis on transfers versus assets in funding old-age consumption.

Life cycle wealth is projected in the following way. Two scenarios are constructed based on the age profiles of per capita consumption and labor income for high- and low-income Asian NTA economies as shown in Figure 1. The consumption and labor income profiles are assumed to shift at a constant rate that is exogenously given. Total consumption and labor income at each age in a given year are calculated by combining the profiles of consumption and labor income with the projected population for each cohort. The present value of consumption and labor income for each cohort is calculated using a constant discount rate. Life cycle wealth at each age is calculated as the difference between the present value of consumption and labor income at each age.

Life cycle wealth arises in part to meet the needs of children, but our interest here is the life cycle wealth required to meet the needs of the elderly. Life cycle pension wealth is defined as life cycle wealth used to fund consumption in old age. In order to isolate life cycle pension wealth, we assumed that adults fund their children and then fund their retirements; hence, life cycle pension wealth is approximated by the positive portion of life cycle wealth held by older adults as shown for Japan in Figure 5.

Transfers and asset-based reallocations as shares of consumption at each age are held constant.[3] Note that transfers include both public and private transfers including familial transfers. We assumed that the ratio of pension assets to pension transfer wealth is equal to the ratio for adults 65 and older. Two age profiles of per capita net transfers by age are used, one from high-income Asian economies and the other from low-income Asian economies. Asset-based reallocations are estimated as the balancing item drawing on the identity that consumption must equal asset-based reallocations plus net transfers plus labor income.

The population estimates and projections used here for 1950–2050 are from the UN Population Division, *World Population Prospects 2008* (UN 2009).[4] Longer-term projections are required to calculate wealth because each cohort must be tracked over its entire lifetime. Thus, long-term projections prepared by the UN Population Division have been used to extend the standard population projections in such a way as to minimize discontinuities that are otherwise introduced into the calculations. Details are available from the authors.

As noted, life cycle wealth can be accumulated in the form of assets or transfer wealth. These values are also projected by assuming that net transfers fund a constant share of consumption by the elderly of a given age. Thus, the importance of net transfers to the elderly varies as the age distribution of the elderly population changes. As will be seen, the very old are more reliant on transfers than the younger elderly, hence the importance of transfers increases as elderly populations become older.

The ratio of life cycle pension wealth to labor income is charted in Figures 6 and 7 at 10-year intervals from 1950 to 2050 for regional groups. The average values are calculated using GDP weights rather than as simple averages of the values for countries that are members of each group. Hence, the values for East Asia are dominated by the PRC, for South Asia by India, and for non-DMCs by Japan. Country values are reported in Appendix Tables 2 and 3.

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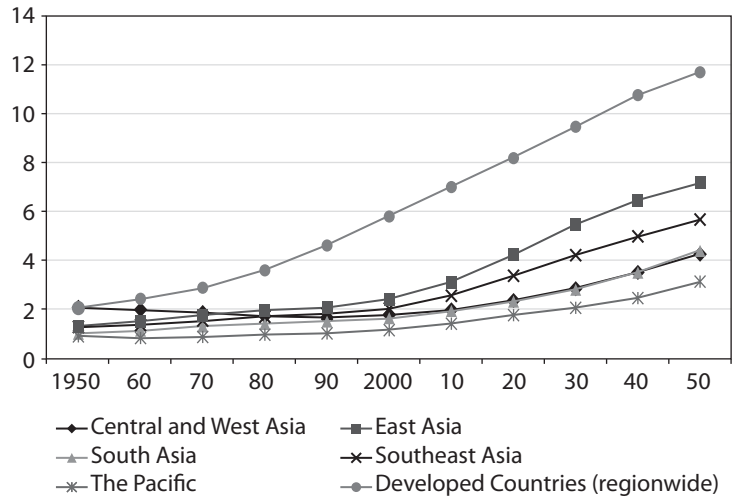
[3] This assumption means that the transfer burden on the non elderly will increase as populations age.

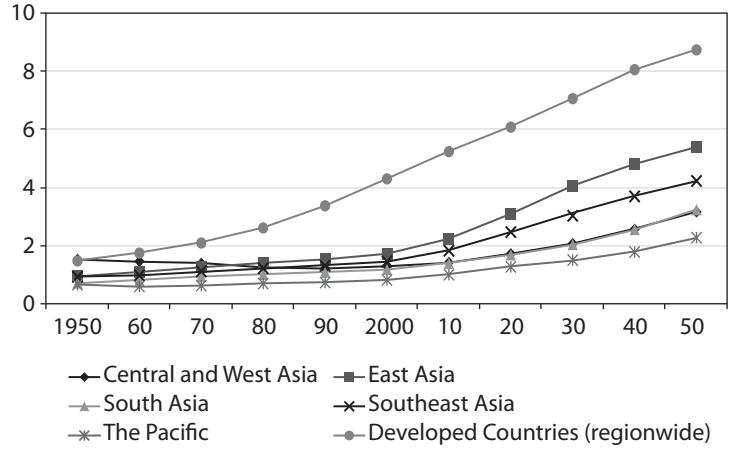
[4] The UN does not produce population projections for Taipei,China and for some small DMCs. Population projections from the NTA database are used for Taipei,China.

Figure 6: Life Cycle Pension Wealth Relative to Labor Income in the Asia and Pacific Region for High-Income Economic Life Cycle Profiles



Source: Authors' calculations.

Figure 7: Life Cycle Pension Wealth Relative to Labor Income in Asia and the Pacific for Low-Income Economic Life Cycle Profiles



Source: Authors' calculations.

The path of the non-DMCs in Figure 6 is striking in two respects. The first is that it begins to rise so early. In 1950 for the high-income profile, life cycle pension wealth is less than twice total labor income, but by 1990 it has doubled. The second feature is that it reaches such high levels approaching 12 times aggregate labor income by 2050. By comparison, DMC regions experienced modest growth in life cycle pension wealth of about 1% per year faster than the growth in labor income before 2000. In Central and West Asia, life cycle pension wealth actually declined relative to income during this period. The effects

of aging are very strong starting around 2000 particularly in East and Southeast Asia. In East Asia, life cycle pension wealth is projected to grow by over 3% per year from 2010 to 2020 compared with productivity growth. For DMCs as a whole, growth in life cycle pension wealth will slow over the next 4 decades but will remain above 1% relative to labor income growth.

Less life cycle pension wealth is required to maintain the low-income life cycle profiles than the high-income profiles. Taking the DMCs as a whole, life cycle pension wealth is about 25% lower though the trends are otherwise very similar, and the most rapid growth in wealth is concentrated between 2010 and 2030 (Figure 7).

Table 5 shows pension transfer wealth for the Asia and Pacific region. DMCs and regional groupings are reported for 2010, 2030, and 2050. Values for each country at 10-year intervals from 1950 to 2050 are provided in Appendix Tables 4 and 5 for both the low- and high-income profiles. The low-income profile is based on both the low-income economic life cycle and the low-income transfer profile while the high-income profile uses the high-income life cycle and the high-income transfer profile.

Pension transfer wealth increases very sharply between 2010 and 2050. Given the low-income profiles, pension transfer wealth almost triples for Central and West Asia, East Asia, South Asia, the Pacific island nations, and DMCs as a whole. The growth is somewhat slower in Southeast Asia. For the non-DMCs, pension transfer wealth does not quite double. Given the high-income profiles, the growth of pension transfer wealth is slower. For the DMCs, the increase is roughly 150% of the 2010 value.

Table 5: Pension Transfer Wealth Relative to Labor Income

	Low-Income Profiles			High-Income Profiles		
	2010	2030	2050	2010	2030	2050
Asia and Pacific Countries	1.1	1.8	2.5	2.6	4.0	5.4
DMCs	0.8	1.4	2.0	1.9	3.2	4.5
Central and West Asia	0.5	0.8	1.3	1.4	2.0	3.0
East Asia	0.9	1.6	2.4	2.2	3.8	5.2
South Asia	0.5	0.8	1.3	1.3	1.9	3.1
Southeast Asia	0.7	1.2	1.8	1.8	2.9	4.0
Pacific Island Nations	0.3	0.5	0.9	1.0	1.4	2.2
Non-DMCs	2.3	3.4	4.3	5.1	7.0	8.7

DMC= developing member countries.
Source: Authors' calculations using the NTA database, available: www.ntaccounts.org, accessed 29 June 2011.

Pension transfer wealth is much higher given the high-income profiles. A useful place to start would be the non-DMCs, which clearly fall into the high-income group. From 2010 to 2050, the required pension transfer wealth rises from 5.1 to 8.7 times total labor income. Pension transfer wealth would be almost 6 times GDP in 2050 given this "business as usual" simulation. To maintain consumption levels growing at the rate of productivity and current retirement patterns would require imposing an implicit debt on future generations

equal to almost 6 times GDP. This compares with total wealth in Japan of about 8 times GDP. Other regions in which pension transfer wealth would reach very high levels given high-income life cycle and transfer patterns are East Asia where it would reach 520% of total labor income in 2050 and Southeast Asia where it would reach 400% of total labor income in 2050.

Pension transfer wealth would be lower if the low-income profiles of consumption, labor income, and net transfers were to persist during the next 40 years. Among the DMCs, East Asia would have the highest pension transfer wealth in 2050 at 240% of total labor income. For all DMCs combined, pension transfer wealth would be 200% of total labor income. Although these values are well below those required to follow the high-income profile path, they are still substantial. The unfunded obligation needed to meet the needs of the elderly in 2050 would be approaching twice the labor income of all workers combined.

The elderly rely more on assets than transfers in low-income countries in Asia and elsewhere. The relative importance of net transfers and asset-based reallocations—asset income less savings—relative to consumption net of labor income varies with the age structure because the older elderly depend more on transfers and less on assets compared with the younger elderly. Confining comparisons to 2000 and later, net transfers as a share of consumption net of labor income for those 65 and older vary from a low of 33% in the Pacific islands and 35% in South Asia to highs of 37% in East Asia and 43% in non-DMCs. By 2050, however, the share of net transfers is projected to rise to 42% in DMCs and 49% in non-DMCs while asset-based reallocations will decline. For DMCs as a whole for example, asset-based flows fund 64% of consumption net of labor income in 2000 and 58% in 2050.

Transfers are much more important and asset-based flows are much less important in the high-income profiles. In 2000 for DMCs, net transfers accounted for almost 70% of consumption net of labor income; asset-based flows accounted for about 30%. Again asset-based flows will decline relative to other sources of support for the elderly as populations age, but the changes are relatively small for the high-income profiles.

Table 6 reports assets relative to labor income required to meet the life cycle needs of the elderly in the coming decades. A surprising aspect of the results is that the assets under the high-income profiles are less than the assets for the low-income profiles. In short this occurs because the high consumption and lower labor income in the high-income profile countries is more than offset by the high net transfers received by the elderly. Hence, higher consumption net of labor income would be supported with lower levels of assets but with higher levels of transfer wealth.

Table 6: Pension Assets Relative to Labor Income

	Low-Income Profiles			High-Income Profiles		
	2010	2030	2050	2010	2030	2050
Asia and Pacific Countries	1.6	2.4	3.0	1.1	1.6	2.0
DMCs	1.2	2.1	2.7	0.8	1.4	1.8
Central and West Asia	0.9	1.3	1.9	0.6	0.9	1.3
East Asia	1.4	2.4	3.0	0.9	1.6	2.0
South Asia	0.9	1.3	2.0	0.6	0.9	1.3
Southeast Asia	1.1	1.9	2.5	0.8	1.3	1.6
Pacific Island Nations	0.7	1.0	1.4	0.5	0.7	1.0
Non-DMCs	2.9	3.7	4.4	1.9	2.5	3.0

DMC= developing member countries.
Source: Authors' calculations using the NTA database, available: www.ntaccounts.org, accessed 29 June 2011.

Two macroeconomic issues are of particular interest. One is that the growth in assets relative to labor income will accelerate economic growth through capital deepening to the extent that greater demand for pension assets in the Asia and Pacific region's economies results in greater investment in the region. Capital deepening in turn leads to higher labor productivity, higher wages, and higher GDP per worker. The simplest case is the constant-returns-to-scale, neoclassical growth model in which capital and labor determine GDP. In this case, growth in capital relative to labor income yields growth in output per worker equal to $\alpha/1-\alpha$ where α is the elasticity of output with respect to capital. Using a typical value for α of one third, a 1% increase in the ratio of capital relative to labor income leads to a 0.5% increase in output per worker. The impact on output per worker of increased pension assets is readily assessed.

The rates of growth of pension assets are quite insensitive to whether the high- or low-income profile is employed, hence the discussion is limited to the low-income profiles (Table 7). Growth in the ratio of pension assets to labor income is particularly rapid in East Asia and Southeast Asia from 2010 to 2030 at 2.9% and 2.6% per annum, respectively. If invested in regional economies, output per worker would grow by 1.45% per annum in East Asia and 1.3% per annum in Southeast Asia.[5] The capital deepening effects drop by almost 67% in East Asia and by 50% in Southeast Asia from 2030 to 2050 compared with 2010 to 2030.

[5] Note that this is a partial analysis in that the feedback from capital deepening to growth in output per worker to the demand for pension assets is not incorporated. General equilibrium models incorporate this feedback. The general findings are not reversed when this feedback is taken into consideration.

Table 7: Annual Growth Rate of Assets Relative to Labor Income (percent)

	Low-Income Profiles		High-Income Profiles	
	2010–2030	2030-2050	2010-2030	2030-2050
Asia and Pacific Countries	2.1	1.2	2.1	1.1
DMCs	2.6	1.3	2.5	1.2
Central and West Asia	1.9	1.9	1.8	1.8
East Asia	2.9	1.1	2.7	1.0
South Asia	1.8	2.2	1.7	2.1
Southeast Asia	2.6	1.3	2.4	1.2
Pacific Island Nations	1.9	1.8	1.8	1.8
Non-DMCs	1.2	0.9	1.2	0.9

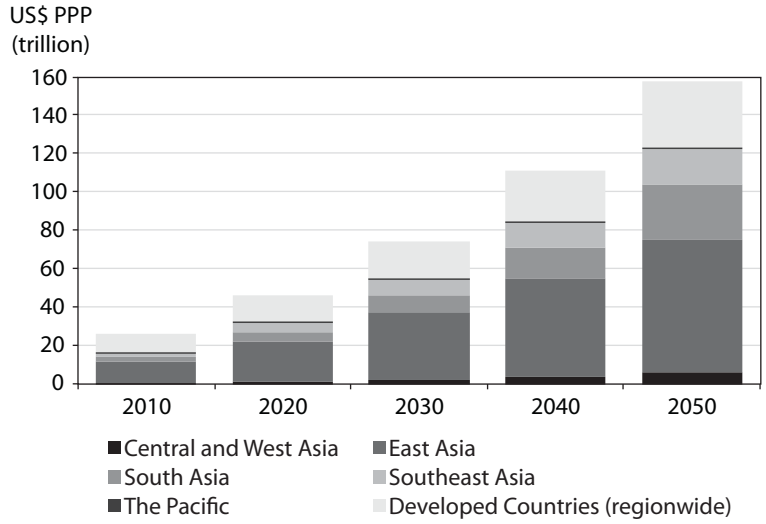
DMC= developing member countries.
Source: Authors' calculations using the NTA database, available: www.ntaccounts.org, accessed 29 June 2011.

In other regions, the rates of capital deepening are similar for 2010–2030 and 2030–2050 at around 2% per annum from 2010 to 2050. Again, applying our very simple rule, this would produce growth in output per worker equal to about 1% per annum. The capital deepening effects dominate the effects of the declining support ratio on output per capita shown in Table 2.

C. Pension Assets

Rapid growth in the populations currently retired and near retirement will lead to rapid growth in pension assets depending on a variety of factors: the rate of economic growth, changes in age patterns of consumption and labor income, and changes in transfer systems. The results presented here are based on simple assumptions and are intended only to illustrate the connections between demographic factors and assets required to support retirement. We have assumed that GDP growth is equal to the rate of growth of the effective labor force plus 3% per year and that labor income is 65% of GDP. Initial GDP estimates are taken from *Key Indicators for Asia and the Pacific* (ADB, various years), and for this purpose we have used purchasing power parity estimates of GDP for the most recently available year, i.e., 2008 or 2009. Pension assets were calculated using the projected values of total labor income for each economy and the ratio of pension assets to labor income summarized in Table 6 and reported in detail in Appendix Tables 6 and 7. The results are summarized in Figure 8, which shows total pension assets by region at 10-year intervals from 2010 to 2050.

Figure 8: Total Pension Assets by Region, 2010–2050



PPP = purchasing power parity.
Note: PPP in US dollars 2008–2009 prices (trillions). GDP growth equal to growth in effective number of consumers plus 3% per year; labor income as a share of GDP constant at 0.65. Low-income age profiles for consumption and labor income; low-income Asian profiles for net transfers.
Source: Authors' calculations.

For 2010, pension assets for the whole region are estimated at $26 trillion, increasing to $158 trillion in 2050. Pension assets are heavily concentrated in East Asia. For 2010, pension assets for East Asian DMCs and for non-DMCs are at $11 trillion and $12 trillion respectively, and by 2050, pension assets for East Asian DMCs will be $69 trillion compared with $35 trillion for non-DMCs.

Pension assets are similar for South and Southeast Asia. In 2010, total pension assets for both regions were between $2 and $3 trillion, but by 2050 they will reach $29 trillion in South Asia and $18 trillion in Southeast Asia. In Central and West Asia total pension assets will grow from $0.5 trillion in 2010 to $6.3 trillion in 2050. For Pacific island nations, the change over the 40-year period will be from $10 billion in 2010 to $149 billion in 2050.

We cannot overemphasize the illustrative nature of these results and the importance of focusing on the broad patterns, i.e., the substantial increase in pension assets and the shifting regional patterns. First, there is a great deal of uncertainty about how rapidly GDP will grow over the next 40 years. Second, we have used age profiles of consumption and labor income from low-income countries where labor income is relatively high and consumption is relatively low in old age. There is certainly reason to believe that consumption at older ages will rise more rapidly than assumed here primarily because of increased spending on health care.

There are two other important complexities to consider. First is the likely change in labor income at older ages. As an empirical matter, labor income at older ages is less important relative to labor earned during the prime working ages in high-income countries. Moreover, relative labor income at older ages has declined very substantially over time in the few economies for which time series estimates are available. If this trend continues, pension assets will grow more rapidly. Public policy, however, is likely to push in the opposite direction as countries raise the pensionable and mandatory retirement ages, reform pension and tax systems to increase incentives to work longer, and reduce the generosity of transfer systems to the elderly. These changes all have the common goal of raising labor income at older ages and may partially or completely offset the decline in labor income that would otherwise occur.

The second important issue is the likely direction of net transfers to the elderly. The elderly in low-income Asia rely to a relatively modest degree on net transfers including familial transfers. As economies develop, public transfer systems have become more important, and familial transfers have become less important. Apparently the increase in public transfers has substantially exceeded the decline in familial transfers judging from the importance of net transfers as a share of consumption in high-income economies like Japan; the Republic of Korea; and Taipei,China. As DMCs develop, they will almost surely place more emphasis on public pensions, health care systems, and other social protection programs, but it also seems likely, given greater awareness of aging issues, that these programs may be more modest than those in place in high-income countries in Asia or elsewhere. Another possibility is that programs may rely more on funded approaches such as those that figure prominently in Singapore. If this proves to be the case, then the pension assets required to maintain standards of living among the elderly could be substantially greater than those shown in Figure 8.

Accumulating pension assets requires life cycle savings,[6] i.e., the combined public and private savings necessary to support old-age consumption given current age-specific patterns of labor income, consumption, and net public and private transfers. Table 8 reports gross life cycle savings as a percentage of GDP. Life cycle savings follows directly from the assumptions made to calculate pension assets and will be sensitive to variations in those assumptions. One additional assumption is that the depreciation rate is 5%. To the extent that pension assets actually exceed those shown above, life cycle savings rates also will be higher.

[6] Another possibility would be to redirect assets accumulated for some other purpose to life cycle needs.

Table 8: Gross Life Cycle Savings as a Percentage of Gross Domestic Product

	2010–2020	2020–2030	2030–2040	2040–2050
Asia and Pacific Countries	12.2	13.6	14.7	15.4
DMCs	10.8	12.2	13.2	14.1
Central and West Asia	7.4	8.4	9.8	11.5
East Asia	12.4	14.2	14.9	15.0
South Asia	7.4	8.4	10.0	12.0
Southeast Asia	10.4	11.7	12.6	13.6
Pacific Island Nations	6.0	6.7	7.4	9.1
Non-DMC	17.6	18.8	20.8	20.7

DMC= developing member countries.

Note. Assumes the following: (i) real GDP growth equal to growth in the effective number of producers plus 3% per year; (ii) labor income is 65% of GDP; (iii) age profiles of consumption and labor income are proportional to low-income NTA estimates; (iv) net transfers as a share of consumption are equal to low-income NTA estimates for Asia; (v) depreciation rate is 5%.

Source: Authors' calculations using the NTA database, available: www.ntaccounts.org, accessed 29 June 2011.

Population aging is consistently leading to higher gross life cycle savings rates. The highest rates are found in the oldest economies and regions—Southeast Asia, East Asia, and especially the non-DMCs. In East Asia, the gross savings rate will increase from 12% to 15% of GDP over the next 4 decades; for the non-DMCs, the increase will be from about 18% to 21%.

A substantial part of the increase in gross savings rates occurs because the capital–output ratio increases with population aging. Consequently, depreciation as a share of GDP rises and gross savings must increase in order to maintain high capital–output ratios. The trend in net savings (not shown) is more varied. For most regions, net savings is higher in 2040–2050 than in 2010–2020, but in East Asia the net savings rates declines from 11% of labor income from 2010 to 2030 to 8.5% from 2040 to 2050. In Southeast Asia, net savings as a share of labor income is relatively constant at slightly more than 9%. Among the non-DMCs, net savings will decline modestly from 2010 to 2050, but during the final decade will be 10% of labor income. Simple generalizations about the relationship between net savings and aging should, however, be made with caution.

The results do not support the view that the large swings in savings in many Asian countries can be explained by the effects of demographic factors on life cycle savings. The difference in gross savings rates for 2010 to 2020 varies from a low of 6% to a high of 17.6%. Much higher rates of savings are found in many East Asian economies. The results also do not support the view that population aging will lead to substantially lower savings rates. As populations age, however, age-specific savings rates must increase in order to generate the higher life cycle wealth required to fund longer periods of retirement. Changes in the age composition of the population tend to offset the effect of the higher age-specific values to some extent. Life cycle savings will eventually plateau and decline modestly, but aggregate pension assets will rise as populations age.[7]

[7] Related empirical literature argues that savings rates are not as low among the elderly as is widely believed. These patterns are influenced by both life cycle savings and nonlife cycle savings. For example, to the extent that the elderly continue to save in old age because they are risk averse or because they want to leave bequests, aging may not lead to lower savings rates.

VIII. Human Capital

The important connection between population aging and human capital may not be immediately apparent to those who do not understand why population aging is occurring. As previously explained, the most important proximate cause of population aging is fertility decline. Aging is especially rapid in East Asia because fertility has declined to such low levels in Japan; Republic of Korea; and Taipei,China. There are certainly some indications that the PRC will follow a similar path with very low fertility already taking hold in many of the most economically advanced provinces. This point is important because of the quantity–quality tradeoff. This idea was first introduced by Gary Becker with important contributions by others studying the economics of fertility (Becker and Lewis 1973, Willis 1973). The idea is that with economic development, parents opt for children of "higher quality." As incomes rise, fertility declines and spending per child rises. To the extent that the higher spending is human capital spending, couples will have fewer children, but those children will be more productive during their working years. At the aggregate level, entering cohorts of workers will be fewer in number, but they will be healthier, more educated, and hence more productive.

The quantity–quality tradeoff described by Becker, Lewis, and Willis refers to private decision making by parents about their own children, but a similar phenomenon may characterize public spending on human capital. Several mechanisms could account for a tradeoff. One possibility is that as the number of children declines, public budget constraints ease and spending per child on education and health rise. Governments may also choose to invest more in children as a mechanism for maintaining growth in tax revenues in the face of lower fertility, possibly in anticipation of increased needs for support for pensions and public health care systems. This idea is consistent with the hypothesis advanced by Becker and Murphy that the increase in transfers to the elderly through pensions was a return on the public investment made in the education of children (Becker and Murphy 1988, Bommier et al. 2010).

Two issues are important here. The first is the return on investment in human capital. Only if that investment actually leads to higher productivity during the working years will spending more per child be a successful alternative to having more children. The returns on education have been studied very extensively and a broad consensus has been reached that the rates are high. There is probably less agreement about the rates of return on investments in health. This literature is reviewed in Lee and Mason (2010).

The second issue is the strength of the tradeoff between quantity and quality. This point has been addressed in a number of recent studies using NTA estimates of spending on the health and education of children. NTA provide average health and education consumption by single year of age through the public and private sectors. A human capital measure has been constructed by summing the single-year-of-age estimates for health from age 0 to 17 and for education from age 0 to 26. Age 26 for education was

selected to include spending on college education, and age 17 was chosen for health to exclude most spending related to child bearing. The tradeoff has been estimated using both cross-section data and times series data (Ogawa et al. 2009, Lee and Mason 2010). The estimated elasticity in the cross-sectional data is –0.68 for all NTA economies, –0.95 for Asian NTA economies, and elasticities greater than –1 based on time series estimates for Japan and Taipei,China. The decline in fertility has resulted in smaller cohorts, but those cohorts have substantially greater human capital investment. In Asia, the total value of human capital may have held steady or may have actually increased.

To what extent can the quantity–quality tradeoff mitigate the effects of low fertility and the associated aging of populations? Simulations based on an elasticity of –1.0 and standard estimates of the return on human capital indicate that increased human capital can entirely offset declines in fertility (Lee and Mason 2010).

IX. Policy Implications and Conclusions

The following are some of the key points that should be considered in thinking about population aging.

First, throughout this paper we have taken population aging as a given which in a sense reflects its near inevitability. Life expectancy has been increasing with regularity in almost all DMCs, and this phenomenon is likely to continue for the foreseeable future. Certainly improving health and reducing mortality are important development goals, and population aging is, in part, a consequence of meeting those goals. Immigration can have some influence on population aging, but for the most part immigration policies will not be decisive because the entire region is aging, many DMCs are enormous and are not likely to be greatly affected by reforms in immigration policies, and many have not been receptive to substantial increases in their immigrant populations.

Fertility is the key demographic factor from a policy perspective because changes in fertility rates have a large impact on population aging and because low-income countries are open to pro-natalist policies. There are, however, some important issues about fertility, e.g., what kinds of policies are likely to be effective and how much should be invested by governments, nongovernment organizations, and the private sector. For the PRC, the pressing issue is the speed with which it abandons the one-child policy.

Second, the economic effects of population aging depend on features of the economic life cycle. The effects will be particularly pronounced if older adults continue to contribute little to GDP through their labor. In many countries, public policies create roadblocks that reduce the productivity of older workers or push them out of the labor force all together. These roadblocks come in a variety of forms, e.g., mandatory retirement ages, tax codes

that undermine work incentives, and pension rules that do the same. Most thinking about productivity at older ages focuses on retirement decisions, but often labor income is low at older ages because of low wages. A priority is to understand why wages of older workers are so low and whether improved employment practices could lead to a more productive older workforce.

The economic pressures from aging also arise because of the high levels of spending on the older elderly in many older, high-income economies. Consumption is high at old age because of high levels of spending on health care. To a great extent, this spending is funded by public transfer systems. A likely prospect and perhaps even a preferred outcome is that spending on health care should rise as countries can afford to spend more on it. While spending on health may be highly valued, there are nonetheless many important issues about health care financing and whether it leads to inefficient systems and unnecessarily high costs.

Third, most DMCs have not established extensive public transfer systems that target the needs of the elderly. As standards of living rise and the administrative capacities of governments improve, they will surely wish to develop more extensive systems of social insurance, The DMCs are, however, in advantageous positions because they have not yet made extensive commitments that will be unsustainable in the future as their populations age.

The only alternative to ratcheting up transfer systems is to increase the accumulation of assets. Accumulating assets does, however, raise a whole host of issues: the respective roles of the private and public sectors, consumer education, financial regulation, and the investment environment. Success will depend on (i) individuals accumulating enough to provide for their needs in old age whether voluntarily or through mandates; (ii) a financial system that is secure and efficient; and (iii) an investment environment that will yield adequate returns without undue risk.

The fourth major issue has to do with successful investments in human capital. The evidence is quite strong that low fertility is leading to high human capital investment, and past experience is promising about the returns on investments in education. An important issue, however, is whether the very high levels of investment we see in very low fertility economies will yield strong returns. It will depend on both the effective administration of education systems and on the capacity of the economy to employ more educated workers.

Appendix: Statistical Tables

Appendix Table 1: Support Ratios for the Asia and Pacific Region, 1950–2050

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Central and West Asia											
Afghanistan	0.739	0.728	0.722	0.708	0.691	0.675	0.679	0.705	0.740	0.787	0.844
Armenia	0.733	0.774	0.761	0.815	0.873	0.870	0.916	0.926	0.918	0.909	0.868
Azerbaijan	0.766	0.783	0.721	0.748	0.808	0.863	0.932	0.953	0.938	0.936	0.910
Georgia	0.821	0.869	0.864	0.885	0.901	0.904	0.938	0.939	0.910	0.886	0.849
Kazakhstan	0.787	0.800	0.784	0.812	0.855	0.882	0.935	0.942	0.935	0.940	0.922
Kyrgyz Republic	0.817	0.808	0.738	0.740	0.763	0.793	0.867	0.916	0.939	0.953	0.934
Pakistan	0.812	0.769	0.737	0.709	0.708	0.723	0.775	0.833	0.880	0.915	0.925
Tajikistan	0.796	0.782	0.693	0.675	0.694	0.712	0.762	0.838	0.893	0.942	0.956
Turkmenistan	0.811	0.786	0.706	0.693	0.731	0.788	0.875	0.939	0.966	0.971	0.944
Uzbekistan	0.832	0.786	0.693	0.686	0.723	0.770	0.864	0.941	0.963	0.961	0.933
East Asia											
China, People's Rep. of	0.844	0.795	0.752	0.777	0.858	0.941	0.990	0.988	0.941	0.903	0.870
Hong Kong, China	0.799	0.774	0.680	0.753	0.865	0.939	0.957	0.910	0.808	0.745	0.703
Mongolia	0.740	0.724	0.716	0.716	0.696	0.798	0.927	1.002	0.992	0.958	0.915
Korea, Rep. of	0.653	0.649	0.638	0.697	0.810	0.898	0.928	0.902	0.817	0.733	0.675
Taipei,China	0.641	0.645	0.648	0.709	0.795	0.873	0.928	0.917	0.847	0.746	0.660
South Asia											
Bangladesh	0.780	0.748	0.709	0.689	0.702	0.768	0.863	0.941	0.976	0.969	0.941
Bhutan	0.722	0.760	0.770	0.777	0.739	0.712	0.839	0.940	0.979	0.973	0.933
India	0.799	0.779	0.751	0.758	0.782	0.814	0.859	0.907	0.948	0.969	0.960
Maldives	0.851	0.789	0.723	0.703	0.651	0.701	0.861	0.994	1.012	0.977	0.914
Nepal	0.763	0.763	0.751	0.734	0.723	0.732	0.782	0.859	0.917	0.942	0.943
Sri Lanka	0.711	0.737	0.752	0.785	0.831	0.899	0.932	0.905	0.888	0.887	0.871
Southeast Asia											
Brunei Darussalam	0.801	0.774	0.744	0.750	0.864	0.914	0.962	0.991	0.992	0.970	0.940
Cambodia	0.738	0.736	0.728	0.716	0.723	0.723	0.797	0.889	0.935	0.958	0.945
Indonesia	0.751	0.765	0.749	0.744	0.783	0.856	0.924	0.959	0.963	0.938	0.906
Lao People's Dem. Rep.	–	–	–	–	–	–	–	–	–	–	–
Malaysia	0.641	0.613	0.583	0.631	0.695	0.748	0.792	0.820	0.838	0.842	0.819
Myanmar	0.838	0.803	0.737	0.722	0.759	0.848	0.926	0.956	0.954	0.937	0.914
Philippines	0.724	0.690	0.676	0.697	0.739	0.779	0.825	0.870	0.901	0.918	0.919
Singapore	0.703	0.673	0.630	0.751	0.898	0.953	0.920	0.861	0.768	0.708	0.681
Thailand	0.722	0.725	0.706	0.726	0.846	0.955	0.986	0.967	0.928	0.901	0.887
Viet Nam	0.866	0.814	0.713	0.669	0.724	0.808	0.926	0.969	0.955	0.923	0.889
Pacific Island Countries											
Fiji, Rep. of	0.674	0.665	0.693	0.748	0.796	0.829	0.849	0.876	0.913	0.932	0.927
Micronesia, Fed. States of	0.748	0.707	0.670	0.633	0.673	0.727	0.743	0.803	0.885	0.944	0.954
Papua New Guinea	0.763	0.744	0.721	0.686	0.723	0.760	0.780	0.811	0.855	0.899	0.931
Samoa	0.679	0.656	0.647	0.684	0.680	0.745	0.712	0.766	0.835	0.880	0.912
Solomon Islands	0.734	0.721	0.701	0.665	0.662	0.711	0.771	0.832	0.884	0.915	0.932
Timor-Leste	0.751	0.755	0.749	0.723	0.758	0.670	0.675	0.702	0.737	0.802	0.863
Tonga	0.651	0.653	0.666	0.676	0.700	0.705	0.761	0.761	0.819	0.871	0.901
Vanuatu	0.681	0.677	0.695	0.682	0.710	0.729	0.769	0.817	0.865	0.904	0.921
Developed Countries											
Australia	0.829	0.779	0.748	0.770	0.818	0.847	0.836	0.805	0.769	0.749	0.737
Japan	0.693	0.746	0.828	0.863	0.852	0.847	0.807	0.768	0.727	0.673	0.637
New Zealand	0.789	0.735	0.700	0.726	0.796	0.833	0.824	0.798	0.766	0.756	0.745

– means data not available.
Source: Authors' calculations.

Appendix Table 2: Life Cycle Wealth Relative to Labor Income, High-Income Profiles

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040
Asia and Pacific Region	**1.44**	**1.64**	**1.90**	**2.17**	**2.48**	**2.93**	**3.64**	**4.59**	**5.64**	**6.61**
Developing Economies	**1.27**	**1.43**	**1.64**	**1.80**	**1.93**	**2.18**	**2.76**	**3.65**	**4.63**	**5.52**
Central and West Asia	**2.09**	**1.99**	**1.88**	**1.73**	**1.68**	**1.78**	**1.99**	**2.37**	**2.85**	**3.52**
Afghanistan	0.80	0.80	0.73	0.72	1.17	1.04	1.01	1.00	1.08	1.29
Armenia	2.87	2.39	2.13	2.03	2.26	3.00	3.55	4.16	4.60	5.33
Azerbaijan	2.50	2.11	1.92	1.71	1.85	1.91	2.36	3.18	3.95	4.79
Georgia	2.82	2.41	2.40	2.45	2.61	3.12	3.78	4.57	5.32	6.17
Kazakhstan	2.42	2.03	1.84	1.70	1.65	1.86	2.13	2.66	3.26	4.00
Kyrgyz Republic	2.44	2.35	2.09	1.90	1.83	1.71	1.92	2.40	3.01	3.84
Pakistan	1.91	1.94	1.87	1.74	1.62	1.71	1.83	2.04	2.41	2.98
Tajikistan	1.93	2.05	1.98	1.71	1.50	1.40	1.66	1.98	2.33	3.01
Turkmenistan	1.85	1.81	1.81	1.71	1.63	1.44	1.64	2.13	2.78	3.69
Uzbekistan	2.11	2.34	2.24	1.89	1.73	1.57	1.81	2.31	2.96	3.95
East Asia	**1.32**	**1.52**	**1.77**	**1.95**	**2.10**	**2.40**	**3.12**	**4.24**	**5.46**	**6.45**
China, People's Rep. of	1.32	1.54	1.77	1.92	2.03	2.28	2.91	3.96	5.09	6.01
Hong Kong, China	1.33	1.71	2.72	3.09	3.36	3.75	5.20	6.82	8.44	9.50
Korea, Rep. of	1.26	1.31	1.53	1.88	2.28	2.93	4.03	5.55	7.28	8.80
Mongolia	1.17	1.25	1.36	1.36	1.37	1.31	1.50	2.10	3.01	4.19
Taipei,China	1.12	1.37	1.71	2.19	2.48	2.90	3.85	5.19	6.59	7.78
South Asia	**1.01**	**1.14**	**1.31**	**1.41**	**1.51**	**1.65**	**1.94**	**2.32**	**2.81**	**3.51**
Bangladesh	1.04	1.14	1.21	1.28	1.34	1.39	1.56	1.95	2.59	3.44
Bhutan	1.00	1.01	1.13	1.19	1.42	2.07	1.88	2.08	2.72	3.81
India	0.98	1.13	1.31	1.41	1.51	1.64	1.93	2.30	2.78	3.47
Maldives	1.36	1.46	1.45	1.42	1.66	1.64	1.60	1.98	2.85	4.17
Nepal	0.81	0.98	1.12	1.25	1.43	1.56	1.67	1.86	2.21	2.77
Sri Lanka	2.10	1.62	1.68	1.84	2.02	2.47	3.25	4.20	4.88	5.48
Southeast Asia	**1.29**	**1.36**	**1.55**	**1.71**	**1.82**	**2.04**	**2.56**	**3.38**	**4.22**	**4.99**
Brunei Darussalam	1.97	1.67	1.32	1.12	1.02	1.27	1.88	2.60	3.38	4.24
Cambodia	0.94	0.91	0.88	1.23	1.24	1.37	1.55	1.73	1.98	2.66
Indonesia	1.15	1.14	1.28	1.45	1.66	1.83	2.16	2.80	3.61	4.42
Lao People's Dem. Rep.	0.88	1.07	1.24	1.49	1.51	1.46	1.57	1.77	2.11	2.69
Malaysia	1.53	1.50	1.61	1.56	1.57	1.78	2.35	3.02	3.66	4.39
Myanmar	1.17	1.46	1.78	1.89	1.80	1.68	2.05	2.67	3.47	4.28
Philippines	1.29	1.34	1.41	1.39	1.42	1.63	1.99	2.42	2.95	3.60
Singapore	1.11	1.37	1.99	2.48	2.95	3.72	5.24	7.13	8.54	9.31
Thailand	1.42	1.56	1.71	1.86	1.85	2.03	2.65	3.65	4.62	5.35
Viet Nam	1.34	1.65	1.99	2.32	2.28	2.24	2.52	3.38	4.33	5.23
Pacific Island Countries	**0.90**	**0.83**	**0.88**	**0.97**	**1.02**	**1.15**	**1.42**	**1.77**	**2.07**	**2.47**
Fiji, Rep. of	1.21	1.11	1.04	0.98	1.11	1.44	1.99	2.50	2.90	3.58
Micronesia, Fed. States of	1.49	1.52	1.57	1.73	1.37	1.29	1.74	2.01	2.05	2.69
Papua New Guinea	0.79	0.68	0.75	0.86	0.89	0.97	1.20	1.54	1.86	2.20
Samoa	0.76	0.75	0.90	1.25	1.62	1.57	2.08	2.48	2.48	2.75
Solomon Islands	1.17	1.47	1.46	1.46	1.38	1.33	1.39	1.64	2.16	2.81
Timor-Leste	0.86	0.81	0.69	0.80	0.86	1.53	1.57	1.56	1.51	1.64
Tonga	0.98	1.01	1.03	1.45	1.84	2.05	2.09	2.52	2.64	2.76
Vanuatu	1.18	1.35	1.44	1.47	1.42	1.52	1.73	2.07	2.41	2.86
Developed Countries	**2.06**	**2.44**	**2.89**	**3.60**	**4.62**	**5.80**	**7.01**	**8.19**	**9.47**	**10.77**
Australia	2.57	2.88	3.29	3.75	3.90	4.44	5.31	6.22	6.87	7.21
Japan	1.94	2.34	2.80	3.57	4.78	6.12	7.40	8.64	10.07	11.58
New Zealand	2.71	2.91	3.28	3.58	3.78	4.08	4.94	5.87	6.47	6.73

Source: Authors' calculations.

Appendix Table 3: Life Cycle Wealth Relative to Labor Income, Low-Income Profiles

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Asia and Pacific Region	**1.04**	**1.17**	**1.36**	**1.57**	**1.81**	**2.13**	**2.66**	**3.37**	**4.18**	**4.92**	**5.54**
Developing Economies	**0.92**	**1.02**	**1.17**	**1.29**	**1.40**	**1.57**	**1.98**	**2.67**	**3.43**	**4.10**	**4.70**
Central and West Asia	**1.53**	**1.46**	**1.39**	**1.26**	**1.23**	**1.30**	**1.42**	**1.72**	**2.07**	**2.57**	**3.16**
Afghanistan	0.57	0.57	0.53	0.51	0.83	0.74	0.73	0.71	0.77	0.91	1.16
Armenia	2.14	1.77	1.58	1.45	1.69	2.22	2.58	3.14	3.42	3.95	4.61
Azerbaijan	1.87	1.58	1.45	1.21	1.36	1.41	1.65	2.34	2.91	3.53	4.30
Georgia	2.12	1.79	1.78	1.78	1.94	2.34	2.77	3.42	3.97	4.59	5.36
Kazakhstan	1.78	1.49	1.37	1.26	1.22	1.37	1.53	1.95	2.38	2.95	3.51
Kyrgyz Republic	1.80	1.75	1.56	1.38	1.37	1.27	1.37	1.75	2.19	2.80	3.60
Pakistan	1.40	1.42	1.38	1.27	1.17	1.24	1.32	1.47	1.74	2.16	2.68
Tajikistan	1.38	1.52	1.47	1.25	1.11	1.04	1.17	1.45	1.69	2.16	2.92
Turkmenistan	1.36	1.33	1.33	1.24	1.22	1.05	1.15	1.54	2.01	2.68	3.53
Uzbekistan	1.51	1.72	1.68	1.38	1.29	1.16	1.28	1.67	2.15	2.87	3.79
East Asia	**0.96**	**1.09**	**1.26**	**1.40**	**1.54**	**1.73**	**2.24**	**3.10**	**4.06**	**4.80**	**5.39**
China, People's Rep. of	0.97	1.11	1.27	1.39	1.49	1.64	2.10	2.88	3.78	4.47	5.04
Hong Kong, China	0.93	1.18	1.90	2.24	2.49	2.69	3.73	5.07	6.29	7.07	7.39
Korea, Rep. of	0.91	0.93	1.09	1.33	1.65	2.12	2.91	4.10	5.45	6.58	7.36
Mongolia	0.84	0.89	0.99	1.00	1.01	0.96	1.05	1.49	2.17	3.06	3.89
Taipei,China	0.79	0.94	1.19	1.57	1.84	2.09	2.79	3.84	4.90	5.82	6.50
South Asia	**0.72**	**0.81**	**0.94**	**1.01**	**1.09**	**1.18**	**1.39**	**1.69**	**2.04**	**2.56**	**3.24**
Bangladesh	0.75	0.82	0.87	0.92	0.97	1.00	1.12	1.39	1.86	2.51	3.15
Bhutan	0.71	0.71	0.80	0.84	1.03	1.51	1.36	1.50	1.94	2.77	3.65
India	0.70	0.81	0.93	1.01	1.09	1.18	1.39	1.67	2.02	2.53	3.22
Maldives	0.98	1.07	1.06	1.00	1.18	1.21	1.14	1.41	2.02	3.02	4.04
Nepal	0.57	0.69	0.80	0.89	1.02	1.13	1.20	1.34	1.59	2.00	2.55
Sri Lanka	1.59	1.17	1.21	1.34	1.46	1.76	2.36	3.12	3.62	4.10	4.52
Southeast Asia	**0.93**	**0.98**	**1.12**	**1.22**	**1.31**	**1.46**	**1.83**	**2.47**	**3.12**	**3.70**	**4.23**
Brunei Darussalam	1.41	1.22	0.97	0.81	0.75	0.88	1.33	1.88	2.48	3.12	3.81
Cambodia	0.68	0.66	0.63	0.88	0.89	0.97	1.11	1.26	1.42	1.89	2.56
Indonesia	0.84	0.81	0.92	1.03	1.19	1.33	1.54	2.02	2.64	3.27	3.78
Lao People's Dem. Rep.	0.62	0.76	0.89	1.07	1.11	1.06	1.13	1.28	1.52	1.93	2.53
Malaysia	1.13	1.08	1.17	1.13	1.13	1.25	1.67	2.20	2.68	3.23	3.89
Myanmar	0.84	1.05	1.28	1.39	1.34	1.22	1.47	1.93	2.53	3.17	3.66
Philippines	0.94	0.96	1.02	1.01	1.02	1.16	1.42	1.75	2.14	2.64	3.22
Singapore	0.77	0.95	1.40	1.75	2.08	2.57	3.74	5.34	6.44	6.91	7.24
Thailand	1.02	1.13	1.24	1.34	1.35	1.46	1.89	2.67	3.43	3.99	4.46
Viet Nam	0.95	1.19	1.43	1.68	1.70	1.63	1.78	2.46	3.21	3.88	4.53
Pacific Island Countries	**0.66**	**0.60**	**0.63**	**0.70**	**0.73**	**0.82**	**1.00**	**1.27**	**1.51**	**1.78**	**2.28**
Fiji, Rep. of	0.90	0.81	0.76	0.72	0.79	1.02	1.42	1.85	2.12	2.62	3.41
Micronesia, Fed. States of	1.09	1.10	1.14	1.27	1.04	0.93	1.25	1.51	1.49	1.91	2.83
Papua New Guinea	0.59	0.48	0.53	0.61	0.63	0.69	0.84	1.10	1.35	1.58	2.00
Samoa	0.55	0.53	0.63	0.93	1.20	1.17	1.50	1.86	1.90	1.97	2.83
Solomon Islands	0.78	1.07	1.07	1.06	1.00	0.96	0.99	1.15	1.53	2.03	2.62
Timor-Leste	0.63	0.59	0.51	0.57	0.61	1.08	1.13	1.14	1.09	1.16	1.38
Tonga	0.70	0.72	0.74	1.05	1.36	1.53	1.55	1.86	1.99	2.05	2.42
Vanuatu	0.84	0.98	1.07	1.10	1.05	1.09	1.23	1.49	1.75	2.07	2.51
Developed Countries	**1.48**	**1.75**	**2.09**	**2.61**	**3.37**	**4.30**	**5.24**	**6.08**	**7.06**	**8.06**	**8.73**
Australia	1.87	2.08	2.38	2.76	2.87	3.24	3.91	4.63	5.14	5.39	5.49
Japan	1.38	1.67	2.03	2.58	3.49	4.55	5.54	6.41	7.50	8.67	9.47
New Zealand	1.99	2.11	2.39	2.65	2.80	2.98	3.61	4.39	4.86	5.03	5.19

Source: Authors' calculations.

Appendix Table 4: Pension Transfer Wealth Relative to Labor Income, High-Income Profiles

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Asia and Pacific Region	**0.95**	**1.09**	**1.28**	**1.48**	**1.71**	**2.04**	**2.57**	**3.25**	**4.02**	**4.75**	**5.38**
Developing Economies	**0.83**	**0.94**	**1.09**	**1.20**	**1.31**	**1.49**	**1.92**	**2.54**	**3.25**	**3.92**	**4.51**
Central and West Asia	**1.41**	**1.35**	**1.27**	**1.18**	**1.14**	**1.21**	**1.37**	**1.63**	**1.97**	**2.47**	**3.00**
Afghanistan	0.50	0.51	0.47	0.46	0.76	0.68	0.66	0.65	0.71	0.85	1.08
Armenia	1.95	1.67	1.47	1.40	1.56	2.06	2.54	2.91	3.24	3.86	4.32
Azerbaijan	1.68	1.47	1.33	1.17	1.25	1.29	1.66	2.20	2.73	3.42	4.09
Georgia	1.91	1.67	1.66	1.68	1.78	2.13	2.66	3.18	3.73	4.42	5.09
Kazakhstan	1.63	1.39	1.25	1.17	1.13	1.26	1.47	1.81	2.25	2.81	3.30
Kyrgyz Republic	1.64	1.61	1.44	1.31	1.24	1.16	1.35	1.64	2.08	2.69	3.41
Pakistan	1.28	1.31	1.26	1.18	1.10	1.17	1.25	1.41	1.67	2.08	2.55
Tajikistan	1.30	1.41	1.36	1.18	1.02	0.96	1.17	1.37	1.61	2.12	2.79
Turkmenistan	1.23	1.24	1.23	1.16	1.11	0.97	1.14	1.45	1.90	2.58	3.35
Uzbekistan	1.42	1.61	1.53	1.31	1.19	1.08	1.28	1.59	2.05	2.78	3.59
East Asia	**0.85**	**1.00**	**1.18**	**1.30**	**1.43**	**1.65**	**2.18**	**2.95**	**3.84**	**4.59**	**5.19**
China, People's Rep. of	0.85	1.01	1.18	1.28	1.37	1.56	2.03	2.75	3.57	4.25	4.83
Hong Kong, China	0.89	1.15	1.86	2.13	2.35	2.67	3.77	4.88	6.09	6.98	7.26
Korea, Rep. of	0.84	0.86	1.03	1.27	1.57	2.04	2.85	3.95	5.20	6.38	7.19
Mongolia	0.76	0.82	0.91	0.92	0.92	0.89	1.03	1.45	2.07	2.92	3.63
Taipei,China	0.74	0.92	1.15	1.48	1.70	2.03	2.74	3.64	4.69	5.63	6.30
South Asia	**0.67**	**0.75**	**0.87**	**0.94**	**1.01**	**1.11**	**1.33**	**1.59**	**1.94**	**2.44**	**3.07**
Bangladesh	0.66	0.74	0.79	0.84	0.89	0.93	1.05	1.31	1.76	2.35	2.93
Bhutan	0.64	0.65	0.73	0.78	0.94	1.40	1.28	1.42	1.88	2.64	3.40
India	0.65	0.74	0.87	0.94	1.01	1.11	1.32	1.57	1.92	2.41	3.06
Maldives	0.89	0.96	0.95	0.93	1.10	1.09	1.09	1.37	1.95	2.90	3.74
Nepal	0.50	0.63	0.72	0.82	0.95	1.04	1.12	1.26	1.50	1.90	2.40
Sri Lanka	1.47	1.11	1.13	1.26	1.38	1.71	2.27	2.93	3.45	3.94	4.30
Southeast Asia	**0.85**	**0.91**	**1.03**	**1.15**	**1.24**	**1.39**	**1.77**	**2.33**	**2.94**	**3.53**	**4.05**
Brunei Darussalam	1.32	1.12	0.89	0.76	0.70	0.86	1.30	1.77	2.36	2.99	3.66
Cambodia	0.60	0.59	0.56	0.80	0.82	0.91	1.03	1.16	1.34	1.82	2.34
Indonesia	0.75	0.75	0.84	0.96	1.11	1.22	1.47	1.92	2.48	3.07	3.57
Lao People's Dem. Rep.	0.56	0.69	0.81	0.97	1.00	0.98	1.06	1.19	1.43	1.84	2.37
Malaysia	1.03	1.03	1.09	1.06	1.07	1.22	1.62	2.08	2.55	3.11	3.74
Myanmar	0.77	0.97	1.20	1.28	1.22	1.15	1.42	1.83	2.41	2.99	3.45
Philippines	0.85	0.89	0.94	0.92	0.96	1.10	1.35	1.65	2.04	2.52	3.07
Singapore	0.76	0.94	1.34	1.70	2.07	2.62	3.72	5.05	6.13	6.82	7.14
Thailand	0.96	1.06	1.16	1.28	1.26	1.38	1.82	2.50	3.20	3.78	4.27
Viet Nam	0.87	1.08	1.32	1.56	1.56	1.55	1.77	2.35	3.02	3.71	4.34
Pacific Island Countries	**0.59**	**0.55**	**0.57**	**0.63**	**0.67**	**0.77**	**0.95**	**1.19**	**1.41**	**1.70**	**2.19**
Fiji, Rep. of	0.82	0.75	0.69	0.65	0.74	0.96	1.33	1.69	1.99	2.52	3.25
Micronesia, Fed. States of	0.99	1.01	1.05	1.15	0.92	0.88	1.19	1.34	1.40	1.88	2.66
Papua New Guinea	0.51	0.44	0.48	0.55	0.58	0.64	0.80	1.04	1.25	1.50	1.93
Samoa	0.50	0.50	0.60	0.84	1.09	1.08	1.45	1.73	1.72	1.97	2.81
Solomon Islands	0.78	0.95	0.97	0.97	0.92	0.89	0.93	1.11	1.46	1.92	2.51
Timor-Leste	0.55	0.53	0.43	0.51	0.56	1.01	1.04	1.05	1.02	1.11	1.29
Tonga	0.65	0.67	0.69	0.98	1.25	1.41	1.45	1.76	1.84	1.94	2.37
Vanuatu	0.77	0.90	0.97	1.01	0.97	1.03	1.17	1.41	1.65	1.98	2.40
Developed Countries	**1.38**	**1.66**	**1.99**	**2.52**	**3.28**	**4.15**	**5.07**	**5.97**	**6.99**	**7.92**	**8.70**
Australia	1.75	1.97	2.28	2.62	2.75	3.18	3.81	4.47	4.98	5.26	5.37
Japan	1.30	1.59	1.92	2.50	3.40	4.38	5.36	6.32	7.45	8.53	9.46
New Zealand	1.84	2.01	2.26	2.50	2.67	2.91	3.53	4.20	4.66	4.91	5.07

Source: Authors' calculations.

Appendix Table 5: Pension Transfer Wealth Relative to Labor Income, Low-Income Profiles

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Asia and Pacific Region	**0.33**	**0.39**	**0.47**	**0.56**	**0.68**	**0.84**	**1.09**	**1.39**	**1.78**	**2.14**	**2.49**
Developing Economies	**0.29**	**0.33**	**0.39**	**0.44**	**0.50**	**0.58**	**0.77**	**1.03**	**1.36**	**1.69**	**2.02**
Central and West Asia	**0.53**	**0.52**	**0.49**	**0.46**	**0.44**	**0.46**	**0.54**	**0.64**	**0.79**	**1.02**	**1.27**
Afghanistan	0.16	0.16	0.15	0.15	0.26	0.23	0.22	0.22	0.24	0.29	0.38
Armenia	0.76	0.68	0.59	0.55	0.63	0.83	1.09	1.26	1.38	1.73	1.90
Azerbaijan	0.64	0.60	0.54	0.44	0.48	0.49	0.66	0.89	1.10	1.48	1.82
Georgia	0.74	0.68	0.67	0.66	0.70	0.85	1.09	1.32	1.56	1.95	2.30
Kazakhstan	0.62	0.54	0.50	0.46	0.44	0.48	0.57	0.70	0.90	1.18	1.42
Kyrgyz Republic	0.63	0.65	0.58	0.52	0.49	0.45	0.53	0.64	0.82	1.12	1.46
Pakistan	0.48	0.49	0.48	0.45	0.42	0.45	0.48	0.55	0.66	0.84	1.05
Tajikistan	0.49	0.57	0.55	0.48	0.40	0.38	0.46	0.55	0.63	0.87	1.18
Turkmenistan	0.45	0.48	0.47	0.44	0.43	0.37	0.44	0.55	0.74	1.05	1.43
Uzbekistan	0.53	0.64	0.61	0.53	0.49	0.43	0.51	0.63	0.81	1.15	1.55
East Asia	**0.29**	**0.34**	**0.42**	**0.47**	**0.55**	**0.64**	**0.88**	**1.21**	**1.63**	**2.01**	**2.37**
China, People's Rep. of	0.29	0.35	0.42	0.46	0.52	0.60	0.81	1.10	1.50	1.83	2.19
Hong Kong, China	0.32	0.41	0.69	0.83	0.99	1.13	1.66	2.18	2.77	3.31	3.51
Korea, Rep. of	0.29	0.30	0.37	0.47	0.61	0.82	1.19	1.72	2.31	2.92	3.39
Mongolia	0.26	0.28	0.32	0.34	0.35	0.35	0.39	0.56	0.80	1.19	1.54
Taipei,China	0.25	0.32	0.40	0.55	0.67	0.82	1.15	1.54	2.04	2.56	2.93
South Asia	**0.23**	**0.26**	**0.31**	**0.33**	**0.37**	**0.41**	**0.51**	**0.61**	**0.76**	**0.99**	**1.27**
Bangladesh	0.21	0.25	0.27	0.29	0.31	0.33	0.38	0.48	0.66	0.91	1.17
Bhutan	0.21	0.21	0.25	0.26	0.33	0.52	0.50	0.55	0.73	1.06	1.40
India	0.23	0.26	0.31	0.33	0.37	0.41	0.50	0.61	0.75	0.97	1.27
Maldives	0.31	0.34	0.33	0.31	0.39	0.40	0.41	0.53	0.74	1.15	1.55
Nepal	0.14	0.20	0.24	0.28	0.33	0.38	0.41	0.47	0.57	0.73	0.94
Sri Lanka	0.62	0.43	0.43	0.49	0.54	0.67	0.92	1.22	1.48	1.76	1.90
Southeast Asia	**0.30**	**0.33**	**0.38**	**0.42**	**0.47**	**0.52**	**0.68**	**0.93**	**1.21**	**1.51**	**1.77**
Brunei Darussalam	0.48	0.42	0.34	0.30	0.28	0.32	0.50	0.68	0.96	1.27	1.61
Cambodia	0.20	0.19	0.18	0.26	0.29	0.32	0.37	0.43	0.50	0.69	0.90
Indonesia	0.26	0.26	0.29	0.33	0.40	0.45	0.55	0.74	0.99	1.26	1.50
Lao People's Dem. Rep.	0.18	0.23	0.27	0.34	0.36	0.36	0.39	0.44	0.54	0.70	0.94
Malaysia	0.39	0.39	0.41	0.40	0.41	0.46	0.62	0.82	1.05	1.33	1.62
Myanmar	0.27	0.35	0.44	0.49	0.48	0.45	0.56	0.71	0.97	1.24	1.47
Philippines	0.30	0.32	0.34	0.33	0.35	0.40	0.50	0.63	0.81	1.03	1.29
Singapore	0.28	0.34	0.48	0.64	0.82	1.04	1.55	2.20	2.78	3.18	3.44
Thailand	0.35	0.40	0.44	0.49	0.49	0.52	0.70	0.97	1.30	1.62	1.89
Viet Nam	0.29	0.38	0.47	0.59	0.62	0.62	0.71	0.96	1.25	1.59	1.93
Pacific Island Countries	**0.20**	**0.19**	**0.19**	**0.21**	**0.23**	**0.27**	**0.34**	**0.44**	**0.54**	**0.67**	**0.88**
Fiji, Rep. of	0.32	0.28	0.25	0.23	0.26	0.34	0.48	0.65	0.79	1.05	1.36
Micronesia, Fed. States of	0.36	0.37	0.38	0.42	0.36	0.33	0.45	0.50	0.54	0.75	1.05
Papua New Guinea	0.17	0.15	0.15	0.17	0.19	0.22	0.28	0.37	0.47	0.58	0.76
Samoa	0.18	0.18	0.21	0.32	0.41	0.44	0.58	0.73	0.74	0.83	1.22
Solomon Islands	0.26	0.32	0.35	0.35	0.33	0.32	0.33	0.40	0.53	0.74	1.03
Timor-Leste	0.18	0.18	0.14	0.16	0.18	0.35	0.37	0.39	0.38	0.41	0.47
Tonga	0.23	0.25	0.26	0.37	0.48	0.56	0.59	0.72	0.78	0.82	0.98
Vanuatu	0.26	0.32	0.36	0.40	0.38	0.39	0.43	0.53	0.64	0.80	0.99
Developed Countries	**0.51**	**0.63**	**0.78**	**1.03**	**1.39**	**1.84**	**2.32**	**2.78**	**3.36**	**3.83**	**4.28**
Australia	0.67	0.76	0.91	1.09	1.17	1.38	1.68	2.01	2.29	2.46	2.54
Japan	0.47	0.60	0.75	1.01	1.45	1.95	2.47	2.95	3.61	4.14	4.68
New Zealand	0.71	0.79	0.90	1.03	1.13	1.25	1.53	1.87	2.12	2.28	2.37

Source: Authors' calculations.

Appendix Table 6: Assets Relative to Labor Income, High-Income Profiles

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Asia and Pacific Region	**0.49**	**0.54**	**0.62**	**0.69**	**0.77**	**0.88**	**1.07**	**1.35**	**1.61**	**1.86**	**2.03**
Developing Economies	**0.44**	**0.48**	**0.55**	**0.59**	**0.62**	**0.68**	**0.84**	**1.12**	**1.39**	**1.61**	**1.78**
Central and West Asia	**0.69**	**0.64**	**0.60**	**0.55**	**0.54**	**0.57**	**0.61**	**0.74**	**0.88**	**1.05**	**1.26**
Afghanistan	0.30	0.29	0.27	0.26	0.41	0.36	0.35	0.34	0.37	0.44	0.55
Armenia	0.92	0.72	0.66	0.62	0.71	0.93	1.01	1.24	1.36	1.47	1.79
Azerbaijan	0.82	0.64	0.59	0.54	0.60	0.62	0.70	0.98	1.22	1.37	1.64
Georgia	0.91	0.74	0.74	0.77	0.83	0.99	1.12	1.39	1.60	1.75	2.01
Kazakhstan	0.79	0.64	0.58	0.54	0.53	0.60	0.66	0.85	1.01	1.19	1.39
Kyrgyz Republic	0.80	0.73	0.66	0.59	0.59	0.55	0.57	0.77	0.94	1.14	1.43
Pakistan	0.63	0.64	0.61	0.56	0.52	0.55	0.58	0.64	0.74	0.91	1.10
Tajikistan	0.63	0.64	0.62	0.53	0.48	0.45	0.49	0.62	0.73	0.89	1.17
Turkmenistan	0.62	0.58	0.58	0.54	0.52	0.46	0.50	0.68	0.87	1.11	1.41
Uzbekistan	0.69	0.73	0.71	0.57	0.53	0.49	0.54	0.72	0.92	1.17	1.49
East Asia	**0.46**	**0.52**	**0.59**	**0.64**	**0.67**	**0.75**	**0.94**	**1.29**	**1.62**	**1.86**	**1.99**
China, People's Rep. of	0.47	0.53	0.59	0.64	0.66	0.72	0.89	1.22	1.53	1.75	1.88
Hong Kong, China	0.44	0.56	0.87	0.97	1.00	1.08	1.43	1.94	2.35	2.52	2.59
Korea, Rep. of	0.43	0.45	0.51	0.60	0.71	0.89	1.18	1.60	2.08	2.43	2.64
Mongolia	0.41	0.43	0.46	0.44	0.45	0.42	0.47	0.65	0.95	1.27	1.54
Taipei,China	0.38	0.45	0.57	0.71	0.78	0.87	1.12	1.54	1.90	2.15	2.37
South Asia	0.34	0.39	0.44	0.47	0.50	0.54	0.62	0.74	0.87	1.07	1.32
Bangladesh	0.38	0.40	0.42	0.44	0.46	0.46	0.51	0.64	0.83	1.09	1.33
Bhutan	0.36	0.36	0.39	0.41	0.48	0.68	0.59	0.65	0.84	1.16	1.49
India	0.33	0.38	0.44	0.47	0.50	0.54	0.61	0.73	0.86	1.06	1.31
Maldives	0.47	0.51	0.50	0.50	0.55	0.54	0.51	0.61	0.89	1.28	1.65
Nepal	0.31	0.35	0.39	0.43	0.49	0.52	0.55	0.60	0.71	0.87	1.09
Sri Lanka	0.63	0.51	0.54	0.59	0.64	0.76	0.98	1.27	1.43	1.54	1.74
Southeast Asia	**0.43**	**0.45**	**0.51**	**0.56**	**0.58**	**0.65**	**0.79**	**1.05**	**1.28**	**1.46**	**1.63**
Brunei Darussalam	0.65	0.55	0.43	0.36	0.32	0.40	0.58	0.83	1.02	1.25	1.47
Cambodia	0.33	0.33	0.32	0.44	0.42	0.46	0.52	0.57	0.64	0.84	1.12
Indonesia	0.40	0.39	0.44	0.49	0.55	0.60	0.69	0.88	1.12	1.34	1.52
Lao People's Dem. Rep.	0.32	0.38	0.44	0.51	0.51	0.48	0.51	0.58	0.68	0.85	1.07
Malaysia	0.50	0.47	0.52	0.50	0.50	0.56	0.73	0.94	1.11	1.28	1.52
Myanmar	0.40	0.49	0.59	0.61	0.58	0.53	0.63	0.84	1.06	1.29	1.45
Philippines	0.44	0.45	0.48	0.46	0.46	0.53	0.64	0.77	0.91	1.09	1.30
Singapore	0.35	0.44	0.65	0.78	0.88	1.10	1.52	2.09	2.41	2.48	2.54
Thailand	0.47	0.51	0.55	0.59	0.58	0.65	0.83	1.16	1.42	1.57	1.70
Viet Nam	0.47	0.57	0.67	0.75	0.72	0.69	0.75	1.02	1.31	1.52	1.72
Pacific Island Countries	**0.31**	**0.29**	**0.31**	**0.34**	**0.35**	**0.39**	**0.47**	**0.58**	**0.66**	**0.76**	**0.95**
Fiji, Rep. of	0.39	0.36	0.35	0.34	0.37	0.48	0.66	0.80	0.90	1.06	1.38
Micronesia, Fed. States of	0.50	0.50	0.52	0.58	0.44	0.41	0.55	0.67	0.65	0.80	1.21
Papua New Guinea	0.28	0.24	0.27	0.31	0.31	0.33	0.40	0.51	0.60	0.69	0.85
Samoa	0.26	0.25	0.31	0.41	0.53	0.49	0.63	0.75	0.76	0.78	1.10
Solomon Islands	0.39	0.52	0.49	0.49	0.46	0.44	0.46	0.54	0.70	0.89	1.09
Timor-Leste	0.31	0.28	0.26	0.29	0.30	0.52	0.53	0.51	0.49	0.52	0.63
Tonga	0.33	0.33	0.33	0.46	0.59	0.65	0.64	0.76	0.80	0.82	0.99
Vanuatu	0.41	0.45	0.47	0.46	0.45	0.49	0.56	0.66	0.76	0.87	1.03
Developed Countries	**0.68**	**0.78**	**0.90**	**1.08**	**1.34**	**1.65**	**1.94**	**2.22**	**2.48**	**2.84**	**3.00**
Australia	0.82	0.91	1.01	1.13	1.14	1.26	1.50	1.75	1.89	1.95	1.97
Japan	0.64	0.75	0.88	1.08	1.39	1.74	2.04	2.32	2.62	3.05	3.24
New Zealand	0.87	0.90	1.02	1.09	1.12	1.17	1.41	1.67	1.81	1.83	1.88

Source: Authors' calculations.

Appendix Table 7: Assets Relative to Labor Income, Low-Income Profiles

	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Asia and Pacific Region	**0.70**	**0.78**	**0.89**	**1.01**	**1.13**	**1.30**	**1.57**	**1.99**	**2.41**	**2.78**	**3.05**
Developing Economies	**0.63**	**0.69**	**0.78**	**0.85**	**0.91**	**0.99**	**1.22**	**1.64**	**2.07**	**2.40**	**2.68**
Central and West Asia	**1.01**	**0.94**	**0.90**	**0.81**	**0.79**	**0.83**	**0.89**	**1.08**	**1.29**	**1.55**	**1.89**
Afghanistan	0.42	0.41	0.38	0.36	0.58	0.52	0.50	0.49	0.52	0.62	0.78
Armenia	1.38	1.08	0.99	0.90	1.06	1.40	1.49	1.88	2.04	2.21	2.71
Azerbaijan	1.23	0.98	0.91	0.77	0.89	0.91	1.00	1.45	1.81	2.05	2.48
Georgia	1.37	1.12	1.12	1.12	1.24	1.49	1.67	2.09	2.41	2.64	3.06
Kazakhstan	1.16	0.95	0.88	0.80	0.78	0.88	0.96	1.25	1.49	1.77	2.09
Kyrgyz Republic	1.17	1.10	0.98	0.87	0.88	0.82	0.83	1.12	1.38	1.69	2.14
Pakistan	0.92	0.93	0.90	0.82	0.75	0.79	0.84	0.92	1.08	1.33	1.63
Tajikistan	0.90	0.95	0.92	0.77	0.71	0.66	0.71	0.90	1.06	1.29	1.74
Turkmenistan	0.91	0.85	0.86	0.79	0.78	0.68	0.71	0.99	1.27	1.63	2.11
Uzbekistan	0.99	1.08	1.06	0.85	0.80	0.73	0.77	1.05	1.34	1.71	2.24
East Asia	**0.67**	**0.74**	**0.84**	**0.93**	**0.99**	**1.08**	**1.36**	**1.89**	**2.43**	**2.79**	**3.02**
China, People's Rep. of	0.68	0.76	0.85	0.92	0.97	1.04	1.29	1.78	2.29	2.63	2.85
Hong Kong, China	0.61	0.77	1.21	1.41	1.50	1.56	2.07	2.89	3.52	3.76	3.87
Korea, Rep. of	0.61	0.64	0.72	0.86	1.03	1.30	1.72	2.39	3.14	3.66	3.98
Mongolia	0.58	0.61	0.66	0.65	0.66	0.61	0.66	0.93	1.37	1.88	2.34
Taipei,China	0.54	0.63	0.79	1.02	1.17	1.27	1.64	2.30	2.87	3.26	3.58
South Asia	**0.49**	**0.55**	**0.63**	**0.68**	**0.72**	**0.77**	**0.89**	**1.08**	**1.28**	**1.57**	**1.97**
Bangladesh	0.54	0.57	0.60	0.63	0.66	0.66	0.74	0.91	1.20	1.61	1.99
Bhutan	0.50	0.50	0.55	0.58	0.70	0.99	0.87	0.95	1.21	1.71	2.25
India	0.48	0.55	0.63	0.68	0.72	0.77	0.89	1.07	1.26	1.56	1.95
Maldives	0.68	0.73	0.72	0.69	0.79	0.80	0.73	0.88	1.28	1.87	2.49
Nepal	0.42	0.49	0.56	0.62	0.69	0.76	0.79	0.87	1.02	1.27	1.61
Sri Lanka	0.97	0.74	0.79	0.86	0.93	1.08	1.44	1.90	2.15	2.34	2.62
Southeast Asia	**0.63**	**0.65**	**0.74**	**0.80**	**0.84**	**0.93**	**1.14**	**1.54**	**1.91**	**2.19**	**2.45**
Brunei Darussalam	0.93	0.80	0.63	0.52	0.48	0.56	0.83	1.20	1.51	1.85	2.20
Cambodia	0.47	0.47	0.46	0.62	0.60	0.65	0.74	0.83	0.93	1.20	1.66
Indonesia	0.58	0.56	0.63	0.70	0.79	0.88	0.99	1.28	1.66	2.02	2.28
Lao People's Dem. Rep.	0.44	0.54	0.62	0.74	0.75	0.71	0.73	0.84	0.99	1.22	1.58
Malaysia	0.75	0.69	0.76	0.73	0.72	0.80	1.05	1.38	1.64	1.91	2.27
Myanmar	0.57	0.70	0.84	0.90	0.86	0.78	0.91	1.22	1.57	1.93	2.19
Philippines	0.63	0.64	0.69	0.68	0.67	0.76	0.92	1.12	1.34	1.61	1.93
Singapore	0.49	0.61	0.92	1.11	1.26	1.53	2.19	3.14	3.67	3.72	3.81
Thailand	0.67	0.73	0.80	0.85	0.86	0.95	1.20	1.70	2.13	2.38	2.57
Viet Nam	0.66	0.81	0.96	1.09	1.08	1.02	1.07	1.50	1.96	2.29	2.60
Pacific Island Countries	**0.46**	**0.41**	**0.44**	**0.49**	**0.50**	**0.55**	**0.66**	**0.83**	**0.97**	**1.11**	**1.39**
Fiji, Rep. of	0.58	0.53	0.51	0.49	0.53	0.68	0.94	1.20	1.33	1.58	2.05
Micronesia, Fed. States of	0.73	0.73	0.76	0.84	0.68	0.60	0.80	1.01	0.95	1.16	1.78
Papua New Guinea	0.42	0.34	0.38	0.44	0.44	0.47	0.56	0.72	0.88	1.00	1.24
Samoa	0.38	0.36	0.42	0.61	0.79	0.73	0.91	1.13	1.17	1.14	1.60
Solomon Islands	0.52	0.75	0.72	0.71	0.67	0.64	0.66	0.76	1.00	1.29	1.60
Timor-Leste	0.46	0.41	0.37	0.41	0.42	0.73	0.76	0.76	0.72	0.75	0.91
Tonga	0.47	0.48	0.48	0.68	0.88	0.97	0.96	1.14	1.21	1.23	1.44
Vanuatu	0.58	0.65	0.71	0.70	0.67	0.70	0.80	0.96	1.11	1.28	1.52
Developed Countries	**0.97**	**1.12**	**1.31**	**1.59**	**1.98**	**2.46**	**2.91**	**3.30**	**3.70**	**4.23**	**4.45**
Australia	1.20	1.32	1.47	1.68	1.70	1.86	2.22	2.63	2.85	2.93	2.95
Japan	0.91	1.07	1.28	1.57	2.04	2.60	3.07	3.46	3.89	4.53	4.79
New Zealand	1.29	1.32	1.49	1.63	1.67	1.73	2.08	2.52	2.75	2.75	2.82

Source: Authors' calculations.

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About the Paper

Andrew Mason and Sang-Hyop Lee show how changes in population age structure have been favorable to improved living standards throughout developing Asia during recent decades. However, over the decades, growth in the oldest age groups could serve as a serious drag on economic growth. Given appropriate development policies, however, population aging can lead to increased capital, greater investment in education and health, and continued economic growth.

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